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# ŽARNI RANOŽELJEZNODOBNI GROB IZ BERMA

## Rezultati arheoloških i MDCT istraživanja

## THE EARLY IRON AGE URN GRAVE FROM BERAM

## The results of archaeological and MDCT research

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UDK 903 (497.5 Beram) “638”  
Izvorni znanstveni članak  
Primljeno: 30.7.2014.  
Odobreno: 30. 9. 2014.

UDC 903 (497.5 Beram) “638”  
Original scientific paper  
Received: July 30, 2014  
Approved: September 30, 2014

*Stotinu i trideset godina nakon prvog istraživanja željeznodobne nekropole u Bermu, tijekom 2013. g. provedeno je probno arheološko sondiranje na lokalitetu. Tom je prilikom otkriven žarni grob datiran u sam početak korištenja ove nekropole. U članku su predstavljene rezultati istraživanja koja su osim samih arheoloških iskopavanja i analize materijala obuhvatila i MDCT snimanje pronađenog žarnog groba, restauraciju arheoloških nalaza te različite druge analize koje su upotpunile spoznaje o karakteru i dataciji pronađenog arheološkog materijala.*

*In the course of 2013, one hundred and thirty years after the first excavation of the Iron Age necropolis at Beram, an archaeological test trench was conducted on the site. An urn grave was discovered during the works, which was dated to the very beginning of this necropolis. The results of the excavations are presented in this paper, which, except for the archaeological excavations and analysis of material, also encompassed an MDCT survey of the discovered grave, the restoration of archaeological finds, and various other analyses that filled in the unknowns regarding the character and dating of the unearthed archaeological material.*

**KLJUČNE RIJEČI:** Istra, Beram, željezno doba, žarna nekropola, arheološko i MDCT istraživanje

**KEY WORDS:** Istria, Beram, Iron Age, urn necropolis, archaeological and MDCT research

## UVOD

Srednjovjekovni gradić Beram razvio se na vrhu brežuljka koji dominira samim završetkom kraške udoline Limske drage, prirodne komunikacije koja je zasigurno oduvijek služila kao poveznica između zapadne istarske obale i unutrašnjosti Poluotoka. Limska draga se podno Berma širi stvarajući takozvanu Beramsku valu, široku oko 500 m, bogatu obradivim površinama. Ne čudi stoga što je još tijekom prapovijesti na toj poziciji funkcioniralo gradinsko naselje (sl. 1, 2).



Sl. 1 Karta Istre s naznačenim položajem Berma  
Fig. 1 Map of Istria with the marked position of Beram

Po mišljenjima istraživača koji su se u svojim radovima doticali Berma, prapovijesno naselje bilo je opasano s više koncentričnih gradinskih bedema (Amoroso 1885, 57; Lonza 1977, 56; Kučar 1979, 88). Prvi spomen Berma kao jednog od istarskih *kasteliera* nalazimo kod Kandlera u njegovu djelu *Indicazioni per riconoscere le cose storiche del Litorale: manoscritto ad uso del Conservatore pel Litorale* (Kandler 1855), no jedini egzaktni podaci o beramskom naselju kojima raspolažemo prikupljeni su prilikom istraživanja pripadajuće nekropole, smještene na nižim dijelovima jugozapadne padine brežuljka. Žarnu nekropolu beramske gradine u nekoliko su navrata tijekom 1883. godine istraživala čak trojica istraživača.

## INTRODUCTION

The medieval town of Beram developed atop of a hillock that dominates the far end of a Karst valley called Limska Draga, which is a natural communication that always served as a link between the western coast of Istria and the interior of the peninsula. Limska Draga widens at the foot of Beram, creating the so-called Beramska Vala that is approximately 500 meters wide and rich in fertile land. It is not surprising then that a hillfort settlement functioned on this same location as early as in the prehistoric period (Fig. 1, 2). According to the opinions of explorers who in their papers touched upon Beram, the prehistoric settlement was girded with several concentric hillfort walls (Amoroso 1885, 57; Lonza 1977, 56; Kučar 1979, 88). Kandler was the first to mention Beram as one of the Istrian *castellieri* in his work *Indicazioni per riconoscere le cose storiche del Litorale: manoscritto ad uso del Conservatore per il Litorale* (Kandler 1855), but the only exact data about the settlement at Beram which are at our disposal were gathered during the excavation of its necropolis located on the nether parts of the southwestern slope of the hillock. The urn necropolis of the Beram hillfort was explored on several occasions during 1883, and what is of particular interest is that no less than three explorers headed the excavations. These were at the same time the first archaeological excavations conducted on any prehistoric site in Istria (Mihovilić 2013, 10).

In the course of 2013, one hundred and thirty years after the last archaeological excavations on this site, the Division for Archaeological Heritage of the Croatian Conservation Institute, together with Italian colleagues, conducted a series of archaeological test trenches whose



Sl. 2 Zračna fotografija Berma s naznačenim položajem nekropole  
Fig. 2 Aerial view of Beram with the marked position of the necropolis

To su ujedno bila i prva arheološka istraživanja nekog prapovijesnog lokaliteta u Istri (Mihovilić 2013, 10).

Tijekom 2013., stotinu i trideset godina nakon zadnjih arheoloških istraživanja ovog lokaliteta, Služba za arheološku baštinu Hrvatskog restauratorskog zavoda, zajedno s talijanskim kolegama, pokrenula je probna arheološka sondiranja koja su za cilj imala otkriti potencijal nalazišta za njegova daljnja istraživanja<sup>1</sup>. Istraživanja su iznjedrila nalaze koji sugeriraju rasprostiranje nekropole i izvan dosad poznatih gabarita, a s obzirom na pronađene nalaze poprimila su multidisciplinarni karakter. Osim samih arheoloških istraživanja ona su obuhvatila i MDCT snimanje pronađenog žarnog groba, restauraciju arheoloških nalaza te različite druge analize koje su upotpunile spoznaje o karakteru i dataciji pronađenog arheološkog materijala.

### Dosadašnja istraživanja

Neposredni povod provedbi prvih istraživanja beramske nekropole bili su nalazi koji su tijekom 1883. g. stigli do Carla Marchesettija, tadašnjeg ravnatelja Prirodoslovnog muzeja u Trstu. Bio je to tek dio nestručno iskopanih nalaza, otkrivenih prilikom radova na parceli Ivana Martinčića. Po svjedočenju sudionika, tom je prilikom iskopano dvadeset i pet žarnih grobova na spomenutoj parceli, dok je još pet grobova iskopano tijekom izgradnje ceste u podnožju beramskog brežuljka (Marchesetti 1884, 419). Prilikom iskopavanja još jedne urne na posjedu I. Martinčića, pazinski profesor H. Podersay uspio je sačuvati grobnu žaru od destrukcije te je zajedno s nekoliko pojedinačnih predmeta poslati u Trščanski muzej (Marchesetti 1884, 419). Iako Marchesetti prepoznaje vrijednost nalaza i Beram kao potencijalno bogato arheološko nalazište, prvi istraživač beramske nekropole bio je Karl Moser, gimnazijski profesor iz Trsta. On je prilikom preliminarnog predstavljanja spomenutih nalaza, koje je C. Marchesetti upriličio za članove trščanskog društva *Società Adriatica di Scienze Naturali*, prepoznao važnost lokaliteta i odmah kontaktirao Ferdinanda von Hochstettera iz prirodoslovnog muzeja u Beču. Još iste godine mu je, uz dopuštenje i uz sredstva *Prähistorische Kommission* Carske

goal was to learn more about the potential of this site, with a view of further excavations in the future<sup>1</sup>. These excavations resulted in finds suggesting that the necropolis extended itself beyond its heretofore known expanse, and based on these finds these excavations acquired a multi-disciplinary character. Except for the archaeological excavations, these exploratory activities also encompassed an MDCT survey of the discovered grave, the restoration of archaeological finds, and various other analyses that filled in the unknowns regarding the character and dating of the unearthed archaeological material.

### The excavations conducted to date

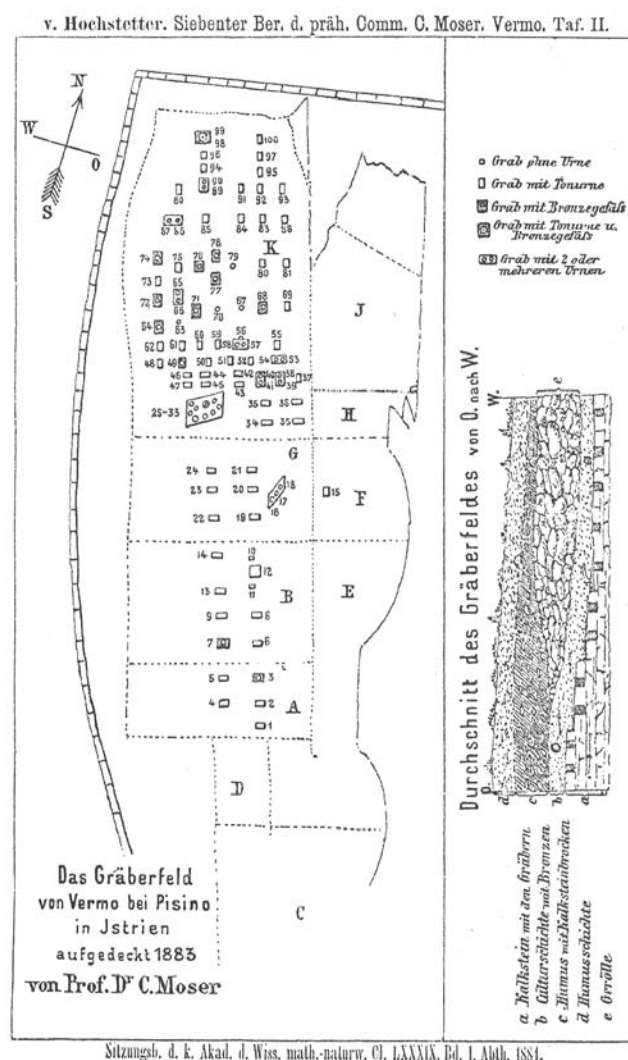
The finds that found their way to Carlo Marchesetti, the then director of the Natural Science Museum at Trieste, in the course of 1883, triggered the initial excavations of the necropolis at Beram. These included only a part of the unprofessionally excavated finds that were discovered during works on the plot of land owned by Ivan Martinčić. According to testimonies made by individuals who participated in these excavations, on this occasion twenty five urn graves were unearthed on the aforementioned plot of land, and another five graves were excavated during road-construction works at the foot of the hillock at Beram (Marchesetti 1884, 419). During the excavation of yet another urn on the estate of I. Martinčić, H. Podersay, a professor from Pazin, managed to salvage a grave urn from destruction, sending it subsequently with a few more individual finds to the museum at Trieste (Marchesetti 1884, 419). Although Marchesetti recognized not only the value of the finds, but also of Beram as a potentially rich archaeological site, the first explorer of the necropolis at Beram was nonetheless Karl Moser, a secondary school professor from Trieste. It was he who during a preliminary presentation of the aforementioned finds, which was organized by C. Marchesetti for members of a society from Trieste called *Società Adriatica di Scienze Naturali*, recognized the importance of the site and immediately notified Ferdinand von Hochstetter from the Museum

<sup>1</sup> Voditelj projekta bio je Josip Višnjić, zamjenik voditelja Tihomir Percan, a u arheološkim istraživanjima sudjelovali su i arheolozi Dario Innocenti, Siniša Pamić i Ivica Pleština te Nenad Kuzmanović. Istraživanja su provedena u suradnji s kolegama iz Ospedali Riuniti iz Trsta te udruge *Accademia Jaufrè Rudel* iz Gradisce d'Isonzo, a financirao ih je Grad Pazin. Istraživanja su provedena na k.č. 24/3 k.o. Beram. Posebno zahvaljujemo dipl. ing.arh. Jadranki Drempetić, čijim je zalaganjem ovaj projekt i pokrenut.

<sup>1</sup> This project was headed by Josip Višnjić, his deputy was Tihomir Percan, and the following archaeologists participated in the archaeological explorations Dario Innocenti, Siniša Pamić, Ivica Pleština and Nenad Kuzmanović. The excavations were carried out in cooperation with the colleagues from Ospedali Riuniti at Trieste, and the association *Accademia Jaufrè Rudel* from Gradisca d'Isonzo, and were financed by the City of Pazin. These excavations were executed on cadastral plot 24/3 of the cadastral commune of Beram. We would like to express our gratitude to Dipl. Ing. Arh. Jadranka Drempetić, thanks to whose efforts this project was started.



akademije znanosti u Beču, omogućeno istraživanje beramske nekropole. Radovi su trajali od 29. kolovoza do 12. rujna, prilikom čega je istraženo 100 grobova na posjedu Ivana Martinčića (Moser 1884). Otkriveni materijal poslan je u Beč, u *Naturhistorisches Museum*, gdje se i danas čuva (sl. 3).



Sl. 3 Plan dijela nekropole istraženog prilikom Moserovih istraživanja (Moser 1884, Tab. II)

Fig. 3 Plan showing the section of the necropolis explored during Moser's excavations (Moser 1884, Tab. II)

Već početkom sljedećeg mjeseca, isprovociran Moserovim postupkom i u želji da se dio nalaza zadrži u lokalnim muzejima, istraživanja u Bermu nastavlja Carlo Marchesetti, u ime *Società Adriatica* iz Trsta. Istražuje na nekoliko parcela, prilikom čega pronalazi mnogobrojne pojedinačne predmete te žarne ukope (Marchesetti 1883; Marchesetti 1884). Građa pronađena tijekom ovih istraživanja pohranjena je u *Civici Musei di Storia ed Arte* u Trstu.

of Natural Science at Vienna. That very same year, accompanied by a permit, and the necessary financial means put at his disposal by the *Prähistorische Kommission* of the Imperial Academy of Sciences at Vienna, he was able to conduct an excavation of the necropolis at Beram. The works lasted from August 29 to September 12, and in this period 100 graves were explored on the estate of Ivan Martinčić (Moser 1884). The discovered material was sent to Vienna, to the *Naturhistorisches Museum*, where it is still kept (Fig. 3).

Already at the beginning of the following month, provoked by Moser's actions and wishing that some of the finds remain in local museums, Carlo Marchesetti continued with the excavations at Beram. He led these excavations in the name of the *Società Adriatica di Scienze Naturali* from Trieste. He explored several plots of land and in the course of this unearthed many individual objects and urn interments (Marchesetti 1883; Marchesetti 1884). The materials discovered in the course of these excavations were deposited at the *Civici Musei di Storia ed Arte* in Trieste.

The last in a series of explorers that in 1883 carried out excavations in the area of the necropolis at Beram was Andrea Amoroso, the then director of the *Museo provinciale* from Poreč. The excavations were executed in the name of the *Società Istriana di Archeologia e Storia Patria*<sup>2</sup>. The necessary financial means were authorized by the Regional Committee of the Istrian Assembly. The works lasted from October 15 to 17, and from November 16 to 29, 1883. A total of 72 graves were unearthed during Amoroso's excavation (Amoroso 1885, 58).

All three of the aforementioned explorers published their reports of these excavations (Fig. 4), and in accordance with the then level of archaeological science, they expressed their conclusions regarding the character of the finds and their dating (Moser 1884; Marchesetti 1883; Marchesetti 1884; Amoroso 1885). They all basically came to the correct conclusion that these were prehistoric graves from the Iron Age, forming analogies with sites from the same period, which were explored up to that point in time. These papers also include drawings of discovered materials, and they are especially valuable and of particular importance for the finds kept at the *Civici Musei di Storia ed Arte*, which had not undergone

<sup>2</sup> *Società Istriana di Archeologia e Storia Patria* was founded as a reaction to Moser's conduct, and already at its first assembly the society founded the Provincial Archaeological Museum (*Museo Archeologico Provinciale*) whose seat was at Poreč (Mihovilić 2012, 104).

Posljednji u nizu istraživača koji su te 1883. g. iskopavali na području beramske nekropole bio je Andrea Amoroso, tadašnji upravitelj *Museo Provinciale* iz Poreča. Istraživanja su obavljena u ime *Società Istriana di Archeologia e Storia Patria*<sup>2</sup>, a njihovo financiranje odobrio je Pokrajinski odbor Istarskog sabora. Radovi su trajali od 15. do 17. listopada te od 16. do 29. studenog 1883. g. U Amorosovim istraživanjima otkrivena su ukupno 72 groba (Amoroso 1885, 58).

Sva trojica istraživača objavila su izvještaje s provedenih istraživanja (sl. 4) te u skladu s tadašnjim razvojem arheološke znanosti iznijela zaključke o karakteru nalaza i njihovoj dataciji (Moser 1884; Marchesetti 1883; Marchesetti 1884; Amoroso 1885). U osnovi svi pravilno zaključuju da se radi o prapovijesnim grobovima iz željeznog doba, a paralele povlače s do tada istraženim istovremenim nalazištima. Posebna su vrijednost ovih članaka crteži pronađenog materijala, što je osobito važno za nalaze koji se čuvaju u tršćanskom *Civici Musei di Storia ed Arte* za koje do danas nije napravljena sustavna analiza niti su adekvatno publicirani<sup>3</sup>.

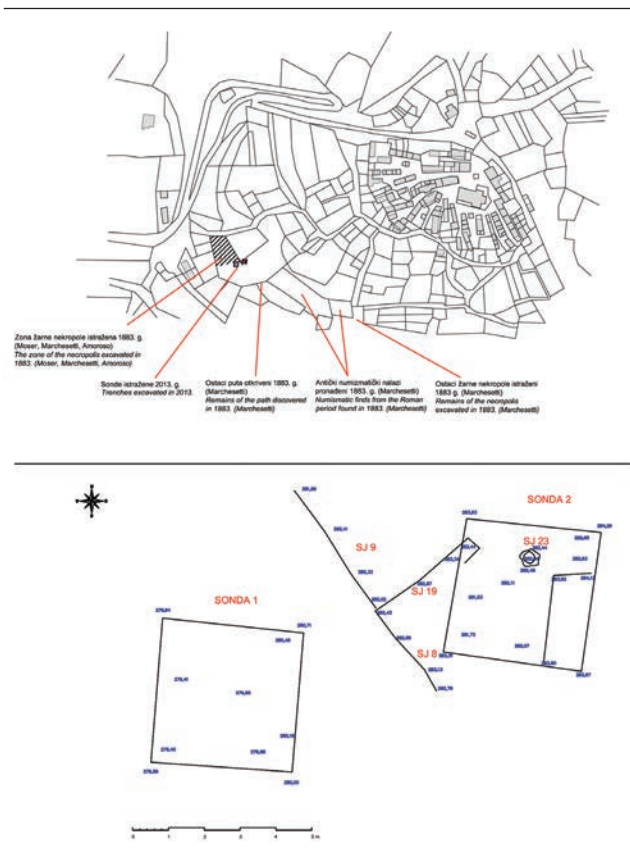
Drugačiju sudbinu doživjeli su nalazi pohranjeni u *Naturhistorisches Museum* u Beču. Naime, te je nalaze, prikupljene tijekom Moserovih istraživanja, u sklopu izrade diplomskog rada nacrtala i obradila Vladimira Kučar (Kučar 1979), što predstavlja do danas najsustavniji rad o beramskom materijalu.

## Dosadašnje spoznaje o beramskoj nekropoli

Među grobovima koje je V. Kučar obradila prevladavali su oni u jednostavnoj grobnoj jami sa žarom koju je pokrivala jedna ili više kamenih ploča (*a pozzeto*). Kod manjeg broja grobova spominje se oblik kamene škrinje (*a cassetina*), dok su treći zastupljeni oblik bile jednostavne grobne jame u kojima su spaljene kosti i prilozi bili stavljeni na dno groba. U dva slučaja pronađene su zidane grobnice s devet, odnosno pet pripadajućih žara (Kučar 1979, 90-111; Cestnik 2009,

<sup>2</sup> *Società Istriana di Archeologia e Storia Patria* osnovana je kao reakcija na Moserov postupak, a već na svojoj prvoj sjednici društvo je osnovalo Arheološki pokrajinski muzej (*Museo Archeologico Provinciale*) sa sjedištem u Poreču (Mihovilić 2012, 104).

<sup>3</sup> Građa prikupljena prilikom istraživanja A. Amorosa bila je pohranjena u *Museo Provinciale* u Poreču, a za vrijeme Drugog svjetskog rata otpremljena je u Trst, odakle je trebala biti vraćena Arheološkom muzeju Istre u Puli. Danas se međutim u inventaru pulskog muzeja nalaze tek dvije keramičke žare, od kojih je jedna parcijalno očuvana, te ulomak brončane lepeze (Mihovilić 2012, 107).



Sl. 4 Katastarski plan Berma s označenim zonama svih dosadašnjih istraživanja (prema: Drempetić 2003), s detaljnim geodetskim snimkom sonde istraženih 2013. godine

Fig. 4 Cadastral map of Beram showing the zones of all excavations carried out to date (after: Drempetić 2003), including a detailed geodetic survey of the trenches explored in 2013

a systematic analysis and had not been adequately published to date<sup>3</sup>.

The finds that were delivered to the *Naturhistorisches Museum* at Vienna were treated differently. These finds, discovered during the excavations conducted by Moser, were drawn and processed within the framework of a graduation thesis prepared by Vladimira Kučar (Kučar 1979), which at the same time represents the most systematic paper covering the Beram material to date.

## Past notions about the necropolis at Beram

Amongst the graves processed by V. Kučar dominated those in the form of a simple sepulchral pit with an

<sup>3</sup> The materials discovered during the exploration conducted by A. Amoroso were kept at the *Museo Provinciale* at Poreč. During World War II these materials were taken to Trieste from where they were supposed to be returned to the Archaeological Museum of Istria at Pula. However, nowadays there are but two pottery urns in the inventory of the museum from Pula, one of which is partially preserved, and a fragment of a bronze fan (Mihovilić 2012, 107).

98-99). Osim keramičkih i brončanih žara, prilikom istraživanja pronađena je i veća količina grobnih priloga. Najčešće se radilo o različitim tipovima igala (29), perli (13), brončanih privjesaka (11), potom o keramičkim pršljenima (11), narukvicama (10), alatima od kosti i roga (8), fibulama (8), gumbima (3), naušnicama (2), mačevima (2), željeznim šilima (2), brusnom kamenu (1), pojasnoj kopči (1) te jednom šljemu u funkciji žare (Kučar 1979, 90-111; Cestnik 2009, 98-99). Nalazi koje je objavila V. Kučar datirani su u razdoblje od Istra II do IV<sup>4</sup>. Riječ je o vremenu između 9. i 6. st. pr. Kr., odnosno periodu željeznog doba tijekom kojeg na području Istre obitavaju Histri.

Pojedini pronađeni luksuzni predmeti, importirani s različitih dijelova Apeninskog poluotoka, kao što su daunijski krater, brončane posude i dijelovi brončanih lepeza, konična kaciga i oružje, svjedoče o posebnom statusu Berma i njegovih stanovnika tijekom željeznog doba (Mihovilić 2013, 88).

### Ritus incineracije u arheološkom kontekstu

Jedna od osnovnih karakteristika kojom se željezno doba u Istri može diferencirati od prethodnih razdoblja jest korištenje spaljivanja kao grobnog ritusa. Za razliku od brončanog doba Istre kada se u grobnom ritusu koristi skeletno pokapanje pod tumulima, krajem drugog tisućljeća prije Krista, odnosno od kasnog brončanog doba počinje se isključivo koristiti spaljivanje pokojnika (Gabrovec, Mihovilić 1987, 320). Ovakva novost u načinu pokopa u tom je trenutku Istru odvojila i od susjedstva, s kojim je u prethodnom razdoblju bila najtješnje povezana (Gabrovec, Mihovilić 1987, 334). Do danas je u Istri poznato tek 29<sup>5</sup> žarnih

urn covered with one or more stone slabs (*a pozzeto*). A chest box form is mentioned in conjunction with a smaller number of graves (*a cassetina*), while the third form represented here consists of simple sepulchral pits in which the bones of the deceased were cremated and offerings placed at the base of the grave. In two instances, masoned graves were discovered, containing nine and five urns respectively (Kučar 1979, 90-111; Cestnik 2009, 98-99). Apart from pottery and bronze urns, a large quantity of grave offerings was likewise discovered during the excavations. Most often these offerings consisted of different types of pins (29), beads (13), bronze pendants (11), pottery whorls (11), bracelets (10), implements made of bone and horn (8), fibulae (8), buttons (3), earrings (2), swords (2), iron awls (2), a grindstone (1), a belt buckle (1), and a helmet that was used as an urn (Kučar 1979, 90-111; Cestnik 2009, 98-99). The finds published by V. Kučar were dated into the Istria II to IV period<sup>4</sup>. We are talking about the period between the 9<sup>th</sup> and the 6<sup>th</sup> century BCE, i.e., the Iron Age period during which the Histri lived on the territory of Istria.

The special status of Beram and its inhabitants during the Iron Age period reflects itself in the discovery of some luxurious objects that were imported from different parts of the Apennine Peninsula, such as a Daunian krater, bronze vessels and parts of bronze fans, a conical helmet and weapons (Mihovilić 2013, 88).

### The incineration rite in an archaeological context

One of the main characteristics on the basis of which we can differentiate the Iron Age in Istria from previous periods of time was the use of incineration as a sepulchral rite. As distinguished from the Bronze Age in Istria, when skeleton burials under tumuli were used in sepulchral rites, towards the end of the 2<sup>nd</sup> millennium, i.e., from

<sup>4</sup> Osim nalaza koji pripadaju željeznom dobu, iz Berma su poznati pojedini nalazi koji pripadaju nekim drugim periodima korištenja ovog lokaliteta. Poznato je primjerice nekoliko litičkih nalaza koje je objavio Marchesetti, a koji su pripadali tadašnjoj privatnoj zbirci labinskog odvjetnika Antonija Scampicchia (član labinske plemićke obitelji koji je živio između 1830. i 1912. g., bio je odvjetnik i zastupnik u Istarskom saboru, a u više navrata i gradonačelnik Labina. Bavio se geologijom i arheologijom pa je u svojoj palači ustanovio prvu istarsku muzejsku zbirku). Oni vjerojatno datiraju iz vremena prije korištenja same nekropole (Marchesetti 1883, 424, fig. 1-4). Marchesetti je prilikom svojih istraživanja pronašao i niz predmeta iz antičkog perioda, među kojima se ističu numizmatički nalazi iz vremena vladavine careva Valerijana, Hadrijana, Maksencija, Galijena i Konstantina (Marchesetti 1884, 266).

<sup>5</sup> To su nekropole: Nezakcij, Šandalja, Punta Kašteja, Pula, Oračina - Prezenak, Rovinj - Sv. Fuma, Val Faborso - Val Saline, Sv. Martin Limski, Limska gradina, Kringa, Beram, Bumberić - Krug, Gradina - Geroldia, M. Ricco - Sv. Martin, Picugi I-III, Dugača - Varvari, Radovac - Antonci, Punčan, Sv. Martin Tarski, Sv. Dionizij, Nova Vas - Valaron, Kaštelir, Kaštel kod Buja, Kašćerga, Bale, Sv. Jelena, Mariškići (Mihovilić 1995, 285, Abb. 2; Mihovilić 2013, sl. 25).

<sup>4</sup> Apart from finds that belong into the Iron Age, there are also individual finds that were unearthed at Beram, which belong into other periods of time when this site was in use. For example, several lithic finds that were published by Marchesetti are known, which used to be part of a private collection of Antonio Scampicchio, who was a lawyer from Labin (Scampicchio was a member of a noble family from Labin, who used to live there between 1830. and 1912. He was a lawyer and a deputy in the Istrian Assembly, and several times he was also the mayor of Labin. He was interested in geology and archaeology and in his palace he established the first Istrian museum collection). They probably date from the period before the necropolis itself began to be used (Marchesetti 1883, 424, Fig. 1-4). During his excavations, Marchesetti also discovered a series of objects from the Roman period, amongst which are numismatic finds from the period of emperors Valerian, Hadrian, Maxentius, Gallienus and Constantin (Marchesetti 1884, 266).



nekropola, što je s obzirom na brojnost gradina prilično oskudno, a samo je manji broj istražen, i to mahom još krajem 19. ili početkom 20. st. (Amoroso 1889; Cestnik 2009; Gabrovec, Mihovilić 1987, 320; Kučar 1979; Mihovilić 1995, 285, Abb. 2; Mihovilić, Teržan, Hänsel, Matošević, Becker 1999, 32; Mihovilić 1972; Mihovilić 2001; Mihovilić 2013, 60).

Kako je već naglašeno, tijekom željeznog doba u Istri se obavljala isključivo incineracija pokojnika, a ostaci su se zatim izravno polagali u grob ili spremali u žaru koja je stavljana u grob. Obično su željeznodobne nekropole smještene između glavnog i sporednog bedema naselja te su često oslonjene na obrambeni zid, što znači da je sam bedem već morao postojati prilikom početka ukopa (Gabrovec, Mihovilić 1987, 318).

Spaljivanje pokojnika obavljalo se unutar samih nekropola na manjim vatrištima ili na ustrinumu neposredno uz nekropolu. Ustrinum, odnosno vatrište u Bermu spominje Amoroso. On ga prepoznaje u neposrednoj blizini nekropole, o čemu su po njegovoj pretpostavci svjedočili crna zemlja i komadići ugljena (Amoroso 1889, 230). Također, ustrinum je konstatiran i na nekropolama u Nezakciju (Mihovilić 2001, sl. 24), Limskoj gradini (Mladin 1969, 290) i Puli (Gnirs 1925, Abb. 28; Menke 1970, 115; Percan 2008, 14).

Kremiranje posmrtnih ostataka simbolički naglašava čist prekid koji predstavlja smrt. Inhumacija i kremiranje, dva glavna načina pokapanja koja su se prakticirala na Zapadu, odražavaju dva različita principa postupanja kada je čovjek suočen sa smrću. Ritus kremiranja, za koji se općenito smatra da je u korelaciji s uranskim – solarnim kultovima, bio bi izraz različitog poimanja zagrobnog života povezanog s postupnim napuštanjem raznih oblika naturalističke religije, u smjeru antropomorfnih božanstava (Peroni 1992). U obredu kremiranja vatra predstavlja sredstvo za deifikaciju pokojnika te isto tako način za pročišćavanje njegovih fizičkih ostataka. Naravno da je pojava obreda spaljivanja puno kompleksnija i još je na određeni način predmet rasprava kada se promatra s vidika povijesnih i proto-povijesnih kultura. S druge strane, neke su proto-povijesne i povijesne kulture, kao što su Etrušćani i Rimljani, s vremena na vrijeme prakticirale obje vrste pogrebnog obreda, bez mogućnosti razlikovanja nekih jasnih preferencija u smislu vjerovanja ili socijalnog statusa pokojnika. Upravo zbog tih su razloga pogrebne žare i ritus kremiranja općenito od osobite važnosti u kontekstu kulturne antropologije.

the Late Bronze Age, cremation of the deceased began to be used exclusively (Gabrovec, Mihovilić 1987, 320). Such a novelty in the mode of interment, separated Istria at that moment from the neighborhood with which it had the closest ties in the past (Gabrovec, Mihovilić 1987, 334). To date only 29<sup>5</sup> urn necropolises are known in Istria, which is a rather modest number if we take into consideration the large number of hillforts; of these only a small part was explored, mostly at the end of the 19<sup>th</sup>, or the beginning of the 20<sup>th</sup> century (Amoroso 1889; Cestnik 2009; Gabrovec, Mihovilić 1987, 320; Kučar 1979; Mihovilić 1995, 285, Fig. 2; Mihovilić, Teržan, Hänsel, Matošević, Becker, 1999, 32; Mihovilić 1972; Mihovilić 2001; Mihovilić 2013, 60).

As was already emphasized before, only cremation of the deceased was in use in Istria during the Iron Age. The cremated remains were placed directly into a grave, or else they were put into an urn which was then placed into a grave. Iron Age necropolises are usually located between the main and the secondary wall of a settlement, and were often leant onto a defensive wall, which means that the wall itself must have been in existence when the interments began (Gabrovec, Mihovilić 1987, 318).

The cremation of the deceased was performed within the necropolises, on smaller pyres or on an ustrinum located immediately along the necropolis. Amoroso mentions an ustrinum or pyre at Beram. He recognized it in the immediate vicinity of the necropolis, and he assumed that this was corroborated by black earth and lumps of coal (Amoroso, 1889, 230). Ustrina were likewise discovered on the necropolises at Nesactium (Mihovilić 2001, Fig. 24), Limska Gradina (Mladin 1969, 290) and Pula (Gnirs 1925, Fig. 28; Menke 1970, 115; Percan 2008, 14).

The cremation of a dead body emphasizes symbolically a clean break that occurs at death. Inhumation and cremation, the two main funerary practices historically practiced in the West, reflect two different mentalities and guidelines on how to act when confronted with death. The cremation rite, generally correlated to the Uranian – Solar cults, is an expression of a different conception of afterlife linked to a gradual abandonment of naturalistic

<sup>5</sup> These are: Nesactium, Šandalja, Punta Kašteja, Pula, Oračina – Prezenak, Rovinj – Sv. Fuma, Val Faborso – Val Saline, Sv. Martin Limski, Limska Gradina, Kringa, Beram, Bumberić – Krug, Gradina – Geroldia, M. Ricco – Sv. Martin, Picugi I-III, Dugača – Varvari, Radovac – Antonci, Punčan, Sv. Martin Tarski, Sv. Dionizij, Nova Vas – Valaron, Kaštelir, Kaštel kod Buja, Kašćerga, Bale, Sv. Jelena, Mariškići (Mihovilić 1995, 285, Fig. 2; Mihovilić 2013, Fig. 25).

Arheološki gledano, postupci kremiranja dostupni su kroz analize različitih tipova primarnih i sekundarnih pogrebnih struktura. Primarne i sekundarne strukture su u ovom kontekstu definirane kao antropogeni prostori sa ili bez grobnih konstrukcija, unutar kojih su pohranjeni kremirani ostaci pokojnika (A. André et al. 2013). Ako polazimo od toga da pogrebna lomača predstavlja primarnu strukturu, možemo prepoznati tri osnovna načina postupanja s kremiranim ostacima:

- a) urna i ostaci pokapaju se na mjestu kremiranja, tj. primarne strukture, a ostaci su ponekad izolirani reorganizacijom sloja nastalog sagorijevanjem;
- b) urna i ostaci smještaju se u zasebne sekundarne strukture;
- c) urna i ostaci smještaju se u istu sekundarnu strukturu. U potonjem slučaju moguće je stratigrafski utvrditi relativnu kronologiju naslaga.

Antropološki gledano, ritual kremiranja je proces podijeljen u nekoliko faza: priprema posmrtnih ostataka pokojnika, polaganje na lomaču, kremiranje, skidanje s vatre, odvajanje skeletnih ostataka iz vatrišta, sakupljanje ostataka, odlaganje, transport i pokop. Slična ritualna složenost zahtijeva sofisticirane analitičke alate. No, nažalost, tek je nedavno dosegnuta spoznaja o potrebi holističkog pristupa pogrebnoj bio-arheologiji, posebice na području kremiranja, gdje se traži sinergija između raznih disciplina s obzirom na radikalne transformacije kostiju prilikom sagorijevanja.

Naime, znanstveno proučavanje pokopa kremiranjem obuhvaća fizičku antropološku procjenu, istraživanje kemijskih procesa izazvanih toplinom, kao i tehnologije same lomače, te post-taložnih procesa i ideologija koje su motivirale ljude da izaberu kremiranje kao način da se riješe posmrtnih ostataka. Iako je u zadnjih nekoliko godina postignut određeni napredak, danas spaljene kosti još uvijek predstavljaju jedan od glavnih izazova s kojima se bio-antropolozi moraju suočiti dok analiziraju ljudske osteološke ostatke. Razlozi tome su veliki stupanj fragmentacije i niz drugih promjena vezanih uz utjecaj vrućine na kosti, koji neminovno narušavaju našu sposobnost da njihovom analizom saznamo što veći broj informacija. Prilično je mali broj istraživanja koja se bave analizom spaljenih ostataka, posebice kada uzmemo u obzir cijelo bogatstvo pogrebnih konteksta koji su nam dostupni te arheoloških analiza pokopa na nekropolama. Razlog tome su dugotrajnost potrebnih analiza, gospodarski resursi te suštinska proceduralna ograničenja, kao i metodološka problematika koja se pojavljuje kod ove vrste predmeta.

religion forms in favor of anthropomorphic deities (Peroni 1992). In the cremation rite, fire represents the means for the deification of the deceased and the purification of the corpse. The phenomenon of the cremation rite, as seen from the perspective of historic and proto-historic cultures, is of course, much more complex and in some ways still under discussion. On the other hand, some proto-historic and historic cultures, such as the Etruscans and the Romans, practiced both types of funeral rites at times, without any clear preferences in terms of beliefs or social status. This is what makes the study of burial and cremation urns so important in the context of cultural anthropology.

From an archaeological perspective, cremation practices can be studied through analyses of different types of primary and secondary funerary structures. Primary and secondary structures are in this context defined as anthropogenic spaces with or without tangible structures, where the cremated remains are or were interred (A. André et al. 2013). Assuming that the funeral pyre represents a primary structure, we can recognize three basic modes in which the cremated remains were arranged:

- a) the urn and the remains are interred at the cremation site, i.e., at the primary structure, with residues sometimes isolated by the reorganization of the combustion layer;
- b) the urn and the remains are placed into separate secondary structures;
- c) the urn and the remains are placed into the same secondary structure. In the latter case it is possible to stratigraphically determine the relative chronology of the deposit.

From an anthropological perspective, the cremation rite is a process divided into several stages: preparation of the corpse, its positioning on the pyre, cremation, removal from the fire, separation of skeletal remains from residues of the fire, collection of the remains, deposition, transportation and burial. A similar ritual complexity requires sophisticated analytical tools. However, unfortunately it was only recently that the need for a holistic approach to funerary bio-archaeology prevailed, especially as far as cremations are concerned, where a synergy between various disciplines is required, given the radical transformation of the bones during combustion. In fact, the scientific study of cremation burial practices encompasses a physical anthropological assessment, the study of heat-induced chemical processes, pyre technology, post-depositional processes, and ideologies



## ISTRAŽIVANJA 2013. GODINE

### Terenska istraživanja

Kako je već spomenuto, probna arheološka sondiranja provedena 2013. godine za cilj su imala otkriti potencijal nalazišta za njegova daljnja istraživanja. S obzirom na razloge pokretanja projekta i raspoloživa sredstva, odlučeno je da će se sondiranja obaviti putem dvije probne arheološke sonde dimenzija 4 x 4 m. Jedna od sondi (sonda 1) pozicionirana je na samom istočnom rubu područja nekropole istraženog 1883., a njezin položaj odabran je s ciljem otkrivanja eventualnog nastavka pružanja nekropole u ovom smjeru. Druga se sonda (sonda 2) nalazila na povišenom platou, sjeverno od dosad istraženih dijelova nekropole. Njezin položaj odabran je u cilju definiranja karaktera neistraženog područja lokaliteta (sl. 4).

Osim manje količine izrazito fragmentiranih ulomaka keramičkih posuda, za koje se na temelju fature i određenih karakterističnih elemenata može okvirno reći da pripadaju željeznom dobu<sup>6</sup>, istraživanja sonde 1 nisu iznjedrila pozitivne arheološke nalaze. Naime, slojevi humusa nad matičnom stijenom na ovom su dijelu bili duboki od 5 do maksimalno 30 cm pa su eventualni arheološki nalazi uslijed intenzivne poljoprivredne eksploatacije ove čestice, provedene do prije nekoliko desetljeća, zasigurno bili uništeni.

Situacija u sondi 2 bila je u potpunosti različita od prethodno opisane. Naime, zbog podupornog zida koji dijeli dvije predmetne čestice na ovom su položaju zaustavljeni erozivni procesi te su arheološki slojevi bili duboki i više od 2 m. Prilikom iskopavanja sonde definirano je više stratigrafskih cjelina (SJ 10-24) i prikupljena je veća količina izrazito fragmentiranih ulomaka keramičkih posuda. Iako se stratigrafija mogla jasno pratiti na temelju promjene boje i strukture zemljanih slojeva, svi nalazi prikupljeni u njima pokazuju gotovo uniformne karakteristike željeznodobne gradinske keramike<sup>7</sup>. Jedino u najnižem sloju sonde (SJ 20) pronalazimo i nekoliko ulomaka

that motivated people to choose cremation as a way to dispose of the deceased. Although some progress has been made in recent years, cremated bones still represent one of the main challenges that bio-anthropologists face when analyzing human skeletons. This is so due to a high degree of fragmentation and other heat-related processes which affect bones and inevitably impair our ability to retrieve information from them. Studies analyzing cremated remains are rather small in number, when compared to the wealth of available funerary contexts and archaeological analyses of graves from a given necropolis. This deficiency is the result of long investigative periods, economic resource-related issues, intrinsic procedural limits, as well as methodological issues resulting from this kind of materials.

## EXCAVATIONS PERFORMED IN 2013

### Field excavations

As was already mentioned, the archaeological test trenches were carried out in 2013, with a goal of discovering the potential of the site for its further excavation. With respect to the reasons that started this project, and the available means to carry it out, it was decided that the probing will consist of two archaeological test trenches measuring 4 x 4 meters. One of the trenches (Trench 1) was positioned on the eastern border of the area of the necropolis which was explored in 1883. Its position was chosen in order to discover whether there was a continuation of the necropolis in this direction. The other trench (Trench 2) was located on an elevated plateau to the north of the heretofore explored sections of the necropolis. Its position was chosen with a goal of identifying the character of the heretofore unexplored section of the site (Fig. 4).

Except for a small quantity of fragments from very fragmented vessels for which we can say, based on fabric and certain other characteristic elements, that they in general belong to the Iron Age<sup>6</sup>, the excavations conducted with Trench 1 did not result in any other positive archaeological finds. The layers of humus above bedrock in this particular section were between 5 and 30 cm thick, meaning that any eventual archaeological finds that could have been found here were surely destroyed due to intensive agricultural activities that were carried out on this plot of land up to a few decades ago.

<sup>6</sup> S obzirom na karakter članka ovom prilikom nećemo ulaziti u detaljnu analizu ostalih nalaza prikupljenih prilikom provedbe arheoloških sondiranja.

<sup>7</sup> Među ukrasima prepoznajemo ulomke oboda ukrašenih utiskivanjem ili urezivanjem te dijelove posuda s plastično apliciranim ukrasima rebra, bradavica i sl. Nadalje, među oblicima posuda prepoznajemo fragmente posuda sa širokim horizontalnim ili izvijenim obodom, zdjelica s kosim, širokim ojačanim ili ojačanim ravnim rubom oboda, ulomke posuda s niskim cilindričnim vratom, dijelove pladnjeva...

<sup>6</sup> Bearing in mind the character of this paper, we will not go into a more detailed analysis of the other finds that were discovered as a result of archaeological probes.

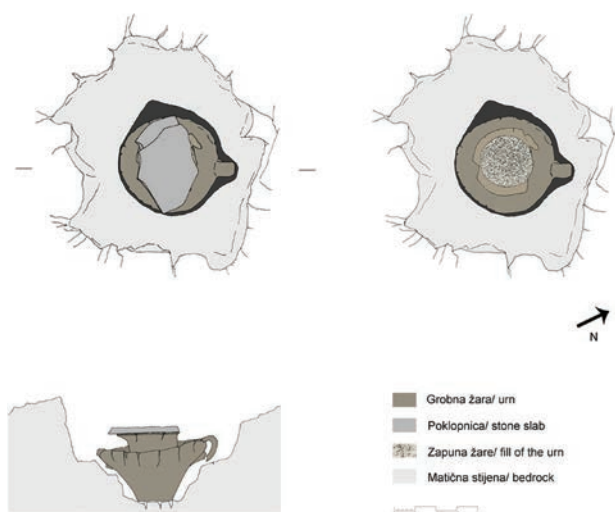
posuda koje svojim karakteristikama odgovaraju nešto ranijem periodu (Istria I)<sup>8</sup>. Ovakvi nalazi sugeriraju i ranije korištenje nalazišta od dosadašnjih datacija same nekropole.

Najznačajniji nalaz ovogodišnjih istraživanja, nalaz čijoj je analizi posvećen ovaj članak, pronađen je na samom dnu sonde 2. Naime, u jugozapadnom dijelu sonde otkriven je grob ukopan u matičnu stijenu<sup>9</sup>. Spaljeni ostaci pokojnika bili su položeni u keramičku urnu i prekriveni pločastim kamenom. Pod pritiskom zemlje koja se nagomilala nad samom urnom, ona se oštetila i deformirala, prilikom čega je vrat s obodom utonuo u samo tijelo posude. Zbog ovakvog je stanja nalaza posuda nakon terenske dokumentacije fiksirana i tek potom podvrgnuta daljnjoj dokumentaciji i istraživanju (sl. 5, 6).



Sl. 5 Žara (SJ 23) prilikom istraživanja, sa i bez poklopnice

Fig. 5 The urn (SU 23) during the excavations, with and without its cover



Sl. 6 Tlocrt i presjek groba SJ 23 prilikom pronalaska

Fig. 6 Ground plan and cross-section of grave SU 23 during its discovery

<sup>8</sup> Riječ je o ulomcima zdjelice s uvučenim obodom te ulomku posude oblika šalice ukrašene trotračnim kanelurama.

<sup>9</sup> U matičnoj stijeni (SJ 21) isklesana je kružna jama (SJ 23) unutar koje je bila postavljena sama žara (SJ 16) s poklopnicom (SJ 24). Skučeni prostor oko žare, unutar jame SJ 23, bio je ispunjen slojem crne zemlje s ostacima ugljena i spaljenih kostiju (SJ 22).

The situation with Trench 2 was completely different from the aforementioned one. Erosion processes were halted on this location due to a supporting wall that separates the two plots of land in question, resulting in archaeological layers that were even more than 2 meters deep. During the excavation of the trench we defined several stratigraphic units (SU 10–24), and collected a large quantity of fragments from very fragmented vessels. Although we were able to clearly follow the stratigraphy on the basis of changes in color and structure of the layers of soil, all the finds discovered in them show almost uniform characteristics of Iron Age hillfort pottery<sup>7</sup>. Only in the lowest layer of the trench (SU 20) did we discover several fragments of vessels whose characteristics correspond to a somewhat earlier period (Istria I)<sup>8</sup>. Such finds also suggest a somewhat earlier use of the site with respect to datings that were made for the necropolis itself to date.

The most important find from this year's excavations, and the find to whose analysis this paper is dedicated, was unearthed at the very bottom of Trench 2. Namely, in the southwestern section of the trench we discovered a grave that was carved out of bedrock<sup>9</sup>. The cremated remains of the deceased were placed into a pottery urn and covered with a stone slab. The urn was damaged under the weight of the soil that accumulated over it, causing its neck together with the rim to sink into the body of the vessel. Due to the condition of the find, after the field documentation procedure was completed, the vessel was fixed and was afterwards subject to further documentation procedures and research activities (Fig. 5, 6).

After it was studied, the vessel was subjected to an MCT examination (Multi-slice Computed Tomography) in the *Ospedale Maggiore* at Trieste, under the expert guidance of Dr. Fabio Cavalli.

<sup>7</sup> Among decorations we recognize rim fragments decorated by impression or incision, as well as vessel parts decorated with ribs, nubs and the like, which were applied in relief. Amongst vessel forms we recognize fragments of vessel with a broad, horizontal, or everted rim, a bowl with a slanted, broad, strengthened, or strengthened, flat edge of the rim, fragments of vessels with a low cylindrical neck, sections of plates...

<sup>8</sup> These are the fragments of a small bowl with a restricted rim, and a fragment of a vessel shaped like a cup decorated with triple channels.

<sup>9</sup> A circular pit (SU 23) was carved out of bedrock (SU 21). Within this pit the urn itself was located (SU 16), with a lid (SU 24). The cramped area around the urn within pit SU 23 was filled with a layer of black soil mixed with the remains of coal and cremated bones (SU 22).

Nakon provedenih istraživanja urna je bila podvrgnuta MCT-u (Multi-slice Computerized Tomography) u *Ospedale Maggiore* u Trstu, pod stručnim vodstvom dr. Fabija Cavallija.

### **Istraživanje žare nedestruktivnom metodom MDCT**

Istraživanje žara uz pomoć multi-detektor kompjutorizirane tomografije (MDCT) do sada je bilo skromno zastupljeno i u literaturi i u praksi. Konvencionalna radiografija prapovijesnih žara obično predstavlja preferiranu metodu pri pokušaju pronalazjenja i određivanja sadržaja žare prije njenoga pražnjenja (Becker et al. 2003). Kompjutoriziranu tomografiju (CT) znanstvenici koji se bave arheologijom i kulturnom baštinom također su prepoznali kao učinkovitu alatku za nedestruktivna istraživanja arheoloških nalaza (Tout et al. 1980; Lynnerup et al. 1997; Conlogue et al. 2004; Rühli et al. 2004; Ryan i Milner 2006; Lynnerup 2010). Jedan od prvih eksperimenata koji je uključivao žare za kremiranje proveden je u Velikoj Britaniji na početku devedesetih godina prošloga stoljeća. Tada su Anderson i kolege skenirali pet rimskodobnih žara (Anderson i Fell 1995). Kasnije je skeniranje CT-om uspješno upotrijebljeno i na etrušćanskim žarama (Minozzi et al. 2010). Oba istraživanja dala su rezultate na temelju kojih je moguće zaključiti da je ta metoda doista vrijedna te da štedi vrijeme pri postupku iskopa, analize i interpretacije žara, s naglaskom na artefaktima, a do neke mjere i na spaljenim ostacima. Nedavno je bilo ukazano na korisnost metode MDCT kao dodatne pomoći pri mikroiskopavanjima, koja je kao nedestruktivna analiza u stanju čak zamijeniti mikroiskopavanja (Cavalli i Pacciani 2013.)

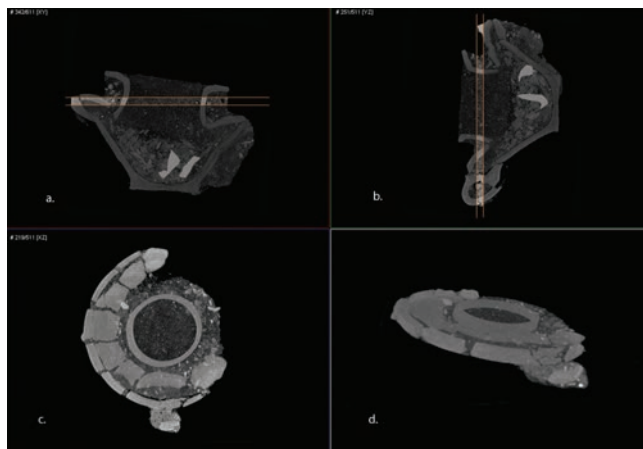
Žara je bila analizirana uz pomoć metode MDCT (Aquilion16, Toshiba, 140 kVp 30 mAs, izometrijski voksel 0,5 x 0,5 x 0,5 mm). Slike su naknadno obrađene, što je rezultiralo nizom 1 cm debelih MIP (Maximum Intensity Projection) rekonstrukcija u aksijalnom smjeru s obzirom na glavnu os žare, što je korišteno kao pomoć tijekom mikroiskopavanja (sl. 7). Nakon preliminarne trodimenzionalne rekonstrukcije, napravljene da bi se utvrdila morfologija i stanje žare te prisutnost ili odsutnost spaljenih ostataka i metalnog materijala unutar nje (sl. 8, 9, 10), primjerak je bio podvrgnut sustavnom istraživanju uz pomoć multiplanarnih rekonstrukcija (MPR), pazeći pritom na položaj, morfologiju i veličinu različitih segmenata. Slijedila je poluautomatska segmentacija urne (sl. 11),

### **Non-destructive study of urns with MDCT**

The study of urns by Multidetector Computed Tomography (MDCT) has had a limited response both in literature and practice. Conventional radiography of prehistoric urns has often been the preferred method when trying to detect and determine the content of an urn before emptying it (Becker et al. 2003). Computed Tomography (CT) has also been recognized as an efficient tool for the non-destructive study of archaeological artifacts by scientists who are dealing with archaeology and cultural heritage (Tout et al. 1980; Lynnerup et al. 1997; Conlogue et al. 2004; Rühli et al. 2004; Ryan and Milner 2006; Lynnerup 2010). One of the first experiments involving prehistoric cremation urns was carried out in the United Kingdom in the early 1990s, when Anderson and others scanned five Roman cremation vessels (Anderson and Fell 1995). Later, CT scans were successfully used on Etruscan cremation urns (Minozzi et al. 2010). Both studies concluded that this method represents a valuable, time-saving tool in the process of excavation, analysis and interpretation of prehistoric urns, with a focus on artifacts, and to a lesser degree on cremated remains. Recently it has been suggested that MDCT can be very useful as an aid to micro-excavation, and being a non-destructive analysis, it can even replace micro-excavation (Cavalli 2012, Pacciani 2012).

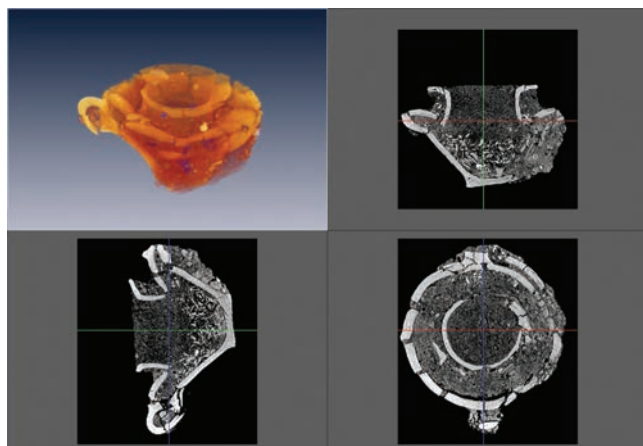
The analysis included the urn, together with abundant residues of surrounding soil, as well as soil obtained from archaeological excavations. The entire specimen was analyzed using MDTC (Aquilion16, Toshiba, 140 kVp 30 mAs, isometric voxel 0.5 x 0.5 x 0.5 mm). The images were post-processed, thus obtaining a series of 1 cm thick Maximum Intensity Projection (MIP) reconstructions in the axial direction with respect to the major axis of the cinerary urn, which served as an aid during micro-excavation (Fig. 7). After preliminary three-dimensional reconstructions to determine the morphology and state of the urn, and the presence or absence of any cremated remains and metallic materials inside it (Fig. 8, 9, 10), the specimen was systematically explored with Multi Plane Reconstructions (MPR), noting the position, morphology and size of the various segments. A semi-automatic segmentation of the urn (Fig. 11), the structured bone fragments (Fig. 12), and any bony structures not clearly recognizable with MPR, followed. The objects of the imagery were then subjected to segmentation and were displayed and analyzed as isolated three-dimensional objects (Fig. 13).





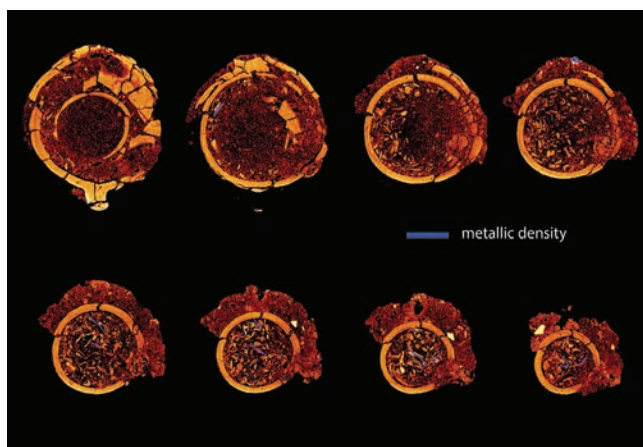
Sl. 7 MDCT baza podataka (sloj 10 mm) s algoritmom Maximum Intensity Projection (MIP)

Fig. 7 MDTC dataset slicing (10 mm) with Maximum Intensity Projection (MIP) algorithm



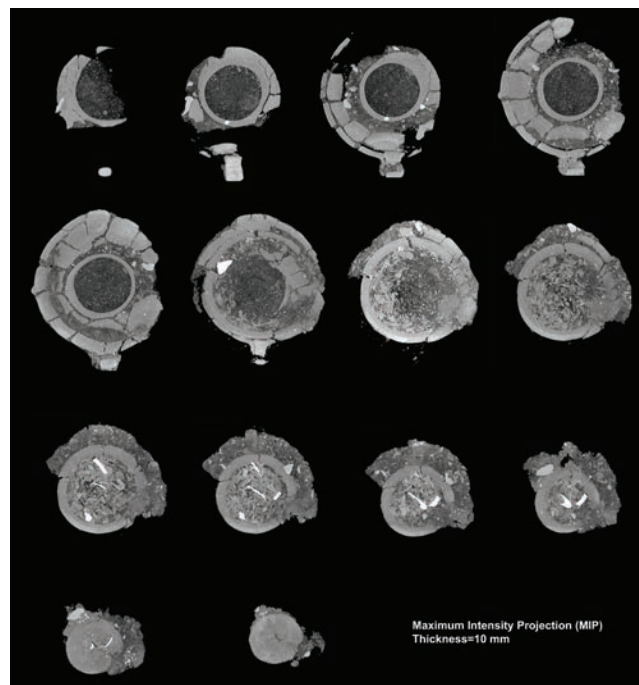
Sl. 9 3-D rekonstrukcija žare s prikazom njenog sadržaja

Fig. 9 3-D reconstruction of the urn with its content



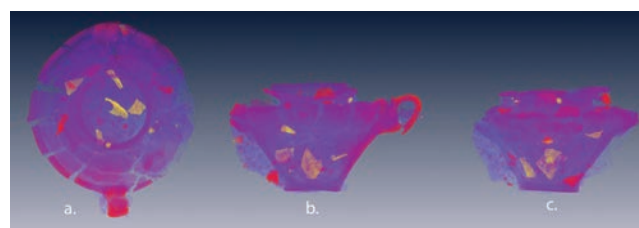
Sl. 11 MIP slike urne (aksijalni presjek) sa skalom boja koje pokazuju metalne predmete, a služe kao pomoć pri mikroiskopavanju

Fig. 11 MIP slicing of the cinerary urn (axial view), with color scale showing metallic artifacts as an aid to micro-excavation



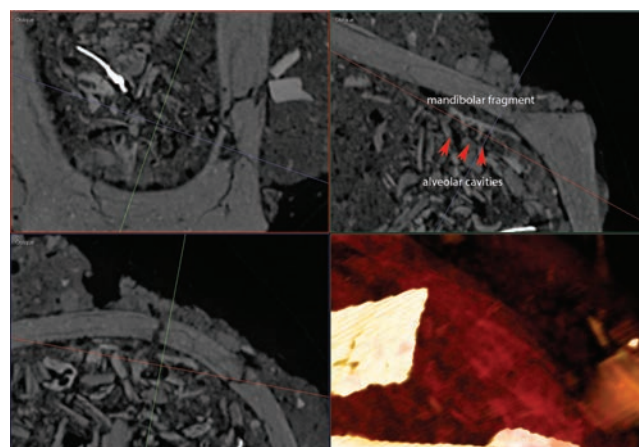
Sl. 8 MIP slike urne (aksijalni presjek) koje služe kao pomoć pri mikroiskopavanju

Fig. 8 MIP slicing of the cinerary urn (axial view) as an aid to micro-excavation



Sl. 10 3-D rekonstrukcija koja pokazuje prisutnost metalnih ulomaka u žari

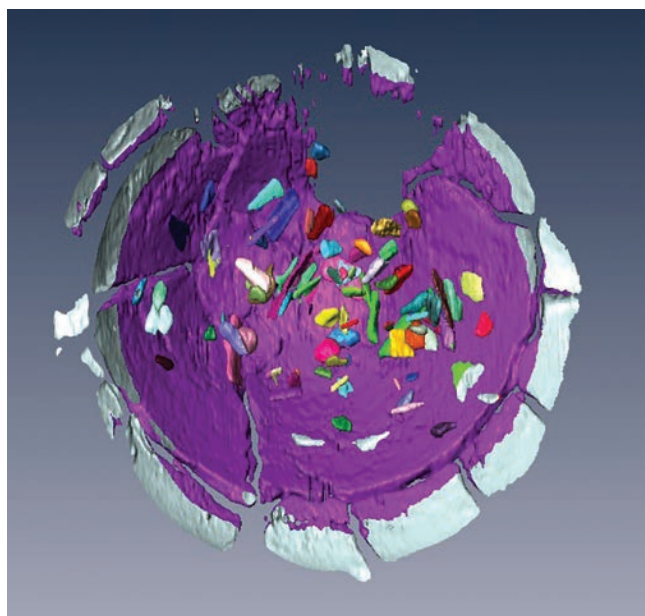
Fig. 10 3-D reconstruction showing metallic fragments inside the urn



Sl. 12 MDCT Multiplanar pogled ulomka spaljene gornje čeljusti

Fig. 12 MDCT Multiplanar view showing a fragment of a cremated maxilla

strukturiranih koštanih ulomaka (sl. 12) te bilo kojih koštanih struktura koje nisu jasno prepoznatljive s MPR-om. Predmeti sa slika zatim su podvrgnuti segmentaciji te prikazani i analizirani kao izolirani i trodimenzionalni (sl. 13).



Sl. 13 3-D snimak nakon segmentacije žare i nekoliko koštanih ulomaka  
Fig. 13 3-D image after segmentation of the urn and some bone fragments

Sljedeći korak bio je istraživanje sadržaja urne, prilikom čega se iznimno dobro mogao komparirati rezultat provedenog MCT snimanja.

### Mikroiskopavanje žare i analiza sadržaja

Žara predstavlja krajnje mjesto pokopa spaljenih ostataka, a njezin sastav (sadržaj, način obloge, prilozi, kvaliteta žare) ima karakter kulturnog horizonta koji odražava status pokojnika. Zbog toga se čini bitnim naglasiti važnost mikroiskopavanja, tj. urednog i dokumentacijom popraćenog pražnjenja žare, ne bi li se prikupilo što više informacija o dinamici taloženja spaljenih ostataka unutar nje. Također, tijekom mikroiskopavanja moguće je pažljivo prikupiti spaljene kosti i tako rekonstruirati kartu njihovog prostornog razmještaja. Međutim, mikroiskopavanje je očito primarni uzrok fragmentacije kostiju. Kremirani ostaci koji su bili spaljeni vatrom manjeg intenziteta pokazuju znatno slabiji stupanj očuvanja od bijelo kalciniranih fragmenata. Stoga postiskopavačke procjene intenziteta kremiranja u pravilu pokazuju značajna odstupanja dobivenih rezultata.

Na temelju osovinskih slika dobivenih metodom MDTC žara je podvrgnuta pažljivom mikroiskopavanju (sl. 14)

The next step was an analysis of the contents of the urn, in the course of which we were in an excellent position to compare the results of the conducted MCT scanning.

### Cinerary urn micro-excavation and content analysis

The ultimate burial place of the cremated remains is a cinerary urn whose composition (content, padding, grave goods, urn quality) is a function of the cultural horizon and the deceased's status. For this reason it seems essential to emphasize the importance of micro-excavation, i.e., the orderly and documented emptying of the urn in order to gather as much information as possible about the deposition dynamics of the cremated remains within it. At the same time, during the micro-excavation it is possible to carefully collect the cremated bones, reconstructing a map of their spatial arrangement. However, micro-excavation is clearly the primary cause of bone fragmentation. The cremated remains that were cremated by lower-intensity fire show a markedly poorer state of preservation as compared with white, calcined fragments. Thus, the post-excavation estimations of cremation intensity are systematically biased.

Based on axial imagery provided by MDTC, the cinerary urn, placed on a support, was carefully micro-excavated (Fig. 14) with the help of wood trenches and soft brushes, trying to preserve 1 cm sections, recording and



Sl. 14 Laboratorijsko mikroiskopavanje žare  
Fig. 14 Laboratory micro-excavation of the urn

removing bone fragments and other material after they were exposed. The main fragments that were recognized in MDTC sections were numbered and photographed

uz pomoć drvenih pipaljki i mekih četki, u nastojanju da se očuvaju i sekcije od 1 cm. Dokumentirani su i prikupljeni ulomci kostiju i drugog materijala. Glavni fragmenti prepoznatljivi u MDTC sekcijama potom su numerirani i fotografirani *in situ*. Materijal je, sloj po sloj, spremljen u različite posude radi naknadnoga ispitivanja.

Spaljeni ostaci su izmjereni i podvrgnuti ultrasonifikaciji (120"), nakon čega su dva dana ostavljeni da se suše na zraku pri sobnoj temperaturi i potom bili izvagani. Vanjsku boju smo odredili uz pomoć specifične kolorimetrijske skale, dok smo boju i teksturu makroskopskih internih fragmenata, koji odgovaraju dijafizi dugih kostiju te diploične lubanjske kosti, utvrdili nakon poliranja, uz pomoć stereo mikroskopa (20x). Fragmenti su naknadno anatomski identificirani, ako je to bilo moguće, te zabilježeni.

Ne bi li se kvantificirao stupanj smanjivanja i morfoloških promjena spaljenih kostiju, neki su fragmenti bili istraženi na SEM (100 – 1000 x).

### Restauracija nalaza i analize izuzetih uzoraka

Predmeti su nakon istraživanja podvrgnuti restauriranju u radionici Odjela za restauriranje kopnenih arheoloških nalaza Hrvatskog restauratorskog zavoda u Zagrebu. Tom je prilikom restaurirana sama žara i metalni predmeti pronađeni u njoj<sup>10</sup>.

Uzorak nepoznatog karaktera primijećen na MDCT snimku kao vertikalno postavljena struktura koja se račvala pri vrhu, visoka približno 7,2 cm, a koji je prilikom

*in situ*. The material was then put in different containers, layer by layer, in order to be subsequently examined.

The cremated remains were measured and then ultrasonicated for 120", air-dried for 2 days at room temperature, and weighed. The exterior color was determined with the help of a specific colorimetric scale, while the color and texture of the macroscopic internal fragments, corresponding to the diaphysis of long bones and to the diploic cranial bone, were determined after polishing with the help of a stereomicroscope (20x). The fragments were subsequently anatomically identified, if possible, and recorded.

To quantify the grade of shrinking and morphological alteration of the cremated bones, some fragments were studied at SEM (100 – 1000 x).

### The restoration of finds and analyses of excluded samples

After the excavation the objects were restored in the workshop of the Department for Land Archaeology of the Croatian Conservation Institute at Zagreb. In this occasion discovered urn was restored together with metal objects found in it<sup>10</sup>.

A sample of an unknown character and visible on the MDCT image in the shape of a vertically oriented structure that forked at the top, approximately 7.2 cm in height, which we were able only to partially preserve during the micro excavation of the urn, was isolated and sent for further analysis to the Natural Science laboratory

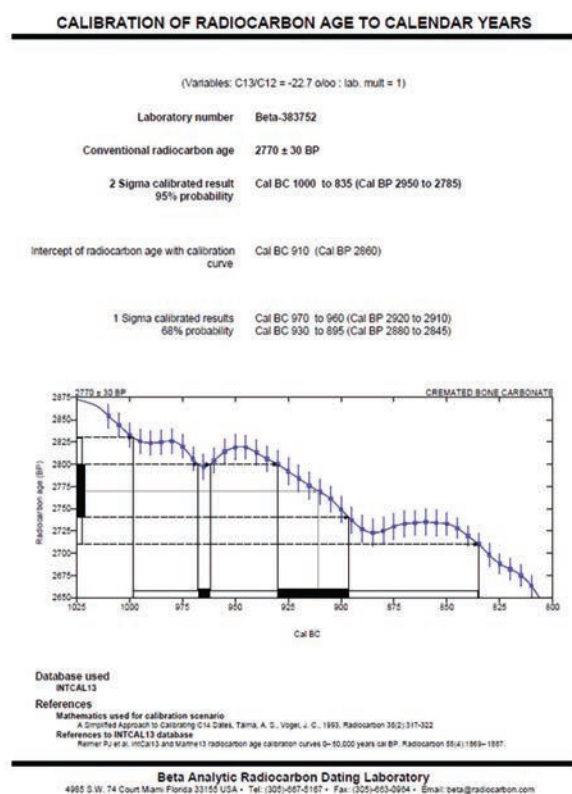
<sup>10</sup> Restauraciju keramičkog materijala obavila je restauratorica Maša Vuković Biruš, a brončanih predmeta restaurator Mihael Golubić. Ulomci keramičke žare najprije su konsolidirani višestrukim potapanjem predmeta u otopinu 3-postotnog akrilnog konsolidata u destiliranoj vodi. Nakon postizanja željene čvrstoće keramike pristupilo se spajanju ulomaka reverzibilnim ljepilom za keramiku Mecosan. Proveden je postupak potpune rekonstrukcije nedostajućih dijelova posude u gipsu, na temelju ulomaka koji su sadržavali sve elemente potrebne za takav zahvat (obod, trbuh i dno). Nakon fine obrade gipsani su dijelovi tonirani akrilnim bojama u ton sličan originalnom. Kod toniranja rekonstruiranih dijelova nastojalo se pratiti nijanse boja zatečenih na posudi. Brončani predmeti čišćeni su mehanički, kombiniranom upotrebom skalpela raznih dimenzija i četkica različitih tvrdoća. Radom pod mikroskopom uklonjene su samo naslage iznad izvorne površine i na taj je način sačuvana autentičnost. Aktivna stabilizacija brončanih predmeta provedena je njihovim potapanjem u 3-postotnu alkoholnu otopinu benzotriazola. Ulomci pojedinih predmeta spajani su dvokomponentnim epoksidnim ljepilom Araldit rapid. U završnoj fazi konzervatorsko-restauratorskog postupka brončani predmeti su površinski zaštićeni premazom laka Paraloid B72 i voska Cosmoloid 80H. Postupak je proveden površinskim premazivanjem.

<sup>10</sup> The restoration of pottery material was carried out by restorer Maša Vuković Biruš, and that of bronze objects by restorer Mihael Golubić. The fragments of the pottery urn were first consolidated with repeated immersions of the object into a 3% solution of an acryl consolidant in distilled water. After the desired strength of the pottery was attained, we proceeded by bonding the fragments with Mecosan, a reversible adhesive used for pottery. A reconstruction of the missing parts was carried out using gypsum, which was done on the basis of fragments that included all the elements needed for such a procedure (rim, belly and base). After being finely treated, the parts made of gypsum were toned with acryl colors in order to make them resemble the original. When toning the reconstructed parts we tried to follow the nuances that were still visible on the original vessel. Objects made of bronze were cleansed mechanically, using scalpels of various sizes, and brushes with soft to hard bristles. Top of Form. Using a microscope we removed only the sediments above the original surface, which helped preserve authenticity. An active stabilization of bronze objects was attained by immersing them into a 3% alcoholic solution of benzotriazole. The fragments of individual objects were joined with Araldite rapid, a bi-component epoxy adhesive. In the final phase of the conservation-restoration process, bronze items were protected with a surface coating consisting of Paraloid B72 lacquer and Cosmoloid 80H wax. This procedure was carried out using a paint brush.



mikroiskopavanja žare mogao biti tek parcijalno sačuvan, izoliran je i poslan na daljnju analizu u Prirodoslovni laboratorij Hrvatskog restauratorskog zavoda. Na uzorku su provedene sljedeće metode ispitivanja: fourier transformirana infracrvena spektroskopija (FT-IR), mikroskopska analiza te rendgenska fluorescentna spektroskopija (XRF). Po dobivenim rezultatima analiza može se zaključiti da je analizirani uzorak anorganska supstanca – najvjerojatnije pigment umbra (željezni oksid  $\text{Fe}_2\text{O}_3$  i manganov dioksid  $\text{MnO}_2$ ) s glinom (sl. 22)<sup>11</sup>.

Osim tog uzorka na radiokarbonsku analizu poslan je i izuzeti uzorak spaljene kosti iz same žare. Analiza je napravljena u Beta Analytic inc. laboratoriju u Miamiju, a rađena je u cilju utvrđivanja datacije pronađene grobne cjeline koja je trebala potvrditi rezultate analize pronađenih arheoloških nalaza. Analiza je dala apsolutni datum 970. – 960./ 930. do 895. g. pr. Kr. (68 %), odnosno 1000. – 835. g. pr. Kr. (95%). Preklapanje radiokarbonskog datuma i kalibracijske krivulje poklapa se s 910. g. pr. Kr. (sl. 15).



Sl. 15 Rezultat radiokarbonske analize uzorka kosti iz groba ekstrakcijom kolagena

Fig. 15 Radiocarbon analysis result of a bone sample from the grave, using the collagen extraction method

<sup>11</sup> Analiza je obavljena pod vodstvom dr. sc. Domagoja Mudronja, uz sudjelovanje dipl. ing. preh. teh. Margarete Klofutar i dipl. ing. kem. teh. Mirjane Jelinčić.

of the Croatian Conservation Institute. The following test methods were carried out on the sample: Fourier transform infrared spectroscopy (FT-IR), microscopic analysis, and X-ray fluorescence spectroscopy (XRF). Based on the obtained results it can be concluded that the analyzed sample is an inorganic substance – probably an umbra pigment (iron oxide  $\text{Fe}_2\text{O}_3$ , and manganese dioxide  $\text{MnO}_2$ ) with clay (Fig. 22)<sup>11</sup>.

Apart from the aforementioned sample, an excluded sample of a cremated bone from the urn was likewise sent for a radiocarbon analysis. The analysis was made in the Beta Analytic Inc. laboratory at Miami, its goal being to determine the dating for the discovered grave unit, which was supposed to confirm the results of the analysis of the discovered archaeological finds. This analysis came up with an absolute date 970 – 960/930 – 895 BCE (68%), i.e., 1000 – 835 BCE (95%). The overlap of the radiocarbon date and the calibration curve coincides with 910 BCE (Fig. 15).

## ANALYSING THE FINDS

### Grave urn

The urn discovered during the excavations carried out in 2013 is a pear-shaped vessel with a narrow, flat base and a narrow, cylindrical neck with an everted rim. Located on the shoulder are vertically applied strap handles, between which the vessel is decorated with two nubs (Fig. 16, 17)<sup>12</sup>. Vessels with two handles are very rarely found in Istrian Iron age necropolises. When the urn was discovered, only a single handle was unearthed and preserved, whereas the absence of the other one can be explained by its ritual, i.e., intentional breaking, which represents a phenomenon characteristic of the Villanova culture (Mihovilić 2001a, 173, 175).

Although there are only scant analogies for the discovered vessel form among the published material from Istrian Iron Age necropolises, considering the intentionally broken handle, strong similarities can nevertheless be observed in comparison with the relatively numerous group consisting of mostly richly decorated pottery

<sup>11</sup> The analysis was conducted by Dr. Sc. Domagoj Mudronja, with the collaboration of Dipl. Ing. Margareta Klofutar, and Dipl. Ing. Mirjana Jelinčić.

<sup>12</sup> Clay with gravel, quartzite and calcite temper. On the outer and inner wall the pottery is stained, the colors varying from black, gray and brown, all the way to reddish. The pottery is grayish-brown in section. The vessel is 21.6 cm high, its wall thickness measures 1 cm, the diameter of the rim 16.4 cm, the diameter of the base 7.8 cm.

## ANALIZA NALAZA

### Grobna žara

Žara pronađena prilikom istraživanja 2013. g. kruškolika je posuda s uskim ravnim dnom i uskim cilindričnim vratom izvijenog ušća. Na ramenu su vertikalno aplicirane trakaste ručke, između kojih je posuda ukrašena s dvije bradavice (sl. 16, 17)<sup>12</sup>. Posude s dvije ručke u istarskim su nekropolama vrlo rijetke. Pronađena je i sačuvana samo jedna ručka, dok nedostatak druge ukazuje na mogućnost ritualnog odnosno namjernog odlamanja, što je vilanovska pojava (Mihovilić 2001a, 173, 175).

Iako su izravne paralele za pronađeni oblik posude, s obzirom na jednu namjerno odlomljenu ručku, među objavljenim materijalom istarskih željeznodobnih nekropola prilično oskudne, velike se sličnosti uočavaju u usporedbi s relativno brojnom skupinom mahom bogato ukrašenih keramičkih posuda koje pripadaju stupnju Istra II, odnosno razdoblju 9. i 8. st. pr. Kr. Riječ je o trbušastim vrčevima tipa *Wasserkrug* ili *Henkelkrug*, koji predstavljaju novost u tom periodu na području Istre. Osnovna razlika između žare pronađene prilikom recentnih istraživanja beramske nekropole i tih vrčeva je u broju ručki. Dok je beramska žara imala dvije ručke, od kojih je jedna ritualno odlomljena, *Wasserkrug* vrčevi ih u pravilu imaju samo po jednu. Oni predstavljaju jedan od tipično histarskih oblika posuda zastupljenih tijekom 9. i 8. st. pr. Kr., a njihova upotreba možda traje i nešto duže (Mihovilić 2001, 68).

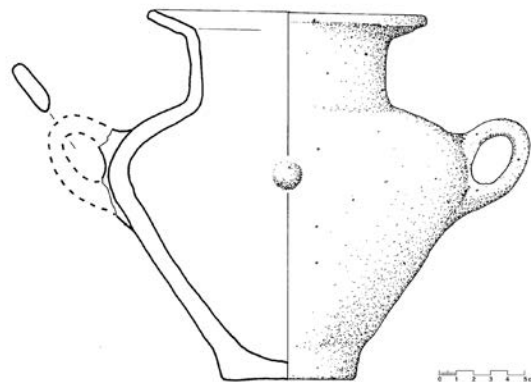
Na susjednim područjima pojava ovog tipa posuda može se pratiti i nešto ranije. Tako se na prostoru istočne Hrvatske u 10. st. pr. Kr. ovaj tip posude javlja u nekropolama Dalj i Vukovar, gdje obično imaju trbuh ukrašen okomitim kanelurama i visoki konični vrat (Vinski-Gasparini 1973, 161). Na području Bosne, u Varvari su datirani u Ha A-B, a na Fortici u Ha B stupanj (Čović 1965, 46). Na Apeninskom poluotoku Peroni je ovakav oblik posude uvrstio među protovilanovske oblike završnog brončanog doba (Peroni 1989, Fig. 25:17), a jednako su uobičajena pojava od 9. st. pr. Kr. na nalazištima *Fossa* kulture (Kilian 1970, 299). U Picenumu, na sjevernom Jadranu i nekropolama Sv. Lucija i Este pojavljuju se u 8. st. pr.

<sup>12</sup> Glina s primjesama pijeska, kvarcita i kalcita. Na vanjskoj i unutarnjoj stijenci keramika je mrljasta, a boje variraju od crne preko sive i smeđe pa sve do crvenkaste. U presjeku je sivkasto-smeđe boje. Visina posude iznosi 21,6 cm, debljina stijenke 1 cm, promjer oboda 16,4 cm, a promjer dna 7,8 cm.



Sl. 16 Žara nakon restauracije (PN 16)

Fig. 16 The urn after completion of the restoration (PN 16)



Sl. 17 Tehnički crtež žare (PN 16)

Fig. 17 Technical drawing of the urn (PN 16)

vessels that belong to the Istria II phase, i.e., to the period of the 9<sup>th</sup> and 8<sup>th</sup> centuries BCE. These are globular jugs of the *Wasserkrug* or *Henkelkrug* type, which represent a novelty of this period on the territory of Istria. The main difference between the urn unearthed in the course of recent excavations on the Beram necropolis, and the aforementioned jugs, is in the number of handles. While the urn from Beram had two handles (one of which was intentionally broken), jugs of the *Wasserkrug* type typically have but a single one. They represent one of the typically Histrian vessel forms that are to be found during the 9<sup>th</sup> and 8<sup>th</sup> centuries BCE, and their use may have lasted a while longer (Mihovilić 2001, 68).

The appearance of this type of vessels in neighboring areas has been noticed even at an earlier stage. Thus, in the region of eastern Croatia in the 10<sup>th</sup> century, this type of vessel occurs on the necropolises of Dalj and Vukovar, where they normally feature a belly decorated with vertical channels and a high, conical neck (Vinski-

Kr. kao odraz kontakata tih prostora s Histrima i Istrom (Mihovilić 2004, 183).

Na istarskim nekropolama željeznog doba ovakvi su primjeri uistinu čest nalaz<sup>13</sup>, no među dosad istraženim materijalom iz Berma klasični primjeri takvih posuda nisu pronađeni. Posuda otkrivena u Bermu prilikom recentnih istraživanja nešto je grublje izrade u odnosu na opisane vrčeve i ima bradavičaste ukrase nekarakteristične za ovaj tip posuda. Najsličniji primjer posude potječe s istog nalazišta gdje je tijekom Moserovih istraživanja pronađena parcijalno sačuvana žara ukrašena bradavičastim ukrasima, no bez ijedne ručke (Kučar 1979, 96, T.V: 8). Bradavičasta se ispupčenja kao ukras na keramici javljaju još tijekom ranog brončanog doba, a karakteristika su prije svega srednjeg brončanog doba (Čović 1983, 126, T. XIV: 1, 7), no nalaze se i na keramici željeznog doba. Slično ukrašene posude nalazimo na nekropolama u Nezakciju (Mihovilić 2001, T.39: 5, 8, 9), Kaštelu kod Buja (Cestnik 2009, T. 1: 1; T. 2: 3; T. 3: 1), u Puli (Percan 2008, T. 3: 19; T. 11: 64), Limskoj gradini (Urem 2012, T. 39: 9, 10, 11) i drugdje. Već je ranije napomenuto da se posude s jednom namjerno (ritualno) odlomljenom ručkom javljaju u vilanovskom kulturnom krugu (Mihovilić 2001a, 173). Iako su rijetki, slični su primjerci poznati i na željeznodobnim nekropolama u Istri. Tako se u Nezakciju u grobovima I/22, 23 javlja posuda kojoj je jedna ručka namjerno odlomljena. Iako je riječ o posudi s dvije horizontalno, a ne okomito postavljene ručke, od kojih je jedna namjerno odlomljena, javlja se zajedno s priložima koji grobnu cjelinu datiraju u 10. odnosno 9. st. pr. Kr., što vremenski odgovara beramskoj žari (Mihovilić 2001, T.31:5; Mihovilić 2001a, 175). Nadalje, žara s parom okomito postavljenih ručki, od kojih je jedna odlomljena, iz groba 36 u Puli (Mihovilić 2001a, 175, T. 2: 2), kao i ona iz groba 67 iz iste nekropole, s obje odlomljene ručke, pokazuju vilanovski utjecaj (Gnirs 1903, Sl.88: 15; Mihovilić 2001a, 175). Žara iz groba 36 u Puli odgovara žarama trbušastog vrča, koje u pravilu imaju po jednu okomito postavljenu malu ručku, dok ova, kao i ona iz Berma, imaju po dvije, od kojih je jedna slomljena (Mihovilić 2001a, 175). Sličnosti postoje i sa žarom s parom okomito postavljenih ručki iz Rima (lokalitet Roma - Forum Romanum), koja predstavlja tipičan oblik 9. st. pr. Kr. (Müller-Karpe

Gasparini 1973, 161). On the territory of Bosnia, in Varvara, they are dated into phase Ha A-B, and on Fortica into Ha B (Čović 1965, 46). On the Apennine Peninsula, Peroni included this type of vessels among the Proto-villanovan forms of the final Bronze Age (Peroni 1989, Fig. 25:17), and from the 9<sup>th</sup> century BCE they also represent a common occurrence on sites of the *Fossa* culture (Kilian 1970, 299). At Picenum, in the northern Adriatic, and on the necropolises of St. Lucia and Este they appear in the 8<sup>th</sup> century BCE as a reflection of the contacts that these regions have with the Histri and Istria (Mihovilić 2004, 183).

On Istrian necropolises of the Iron Age, such examples are indeed common finds<sup>13</sup>, but among the material from Beram that was processed to date, no classical examples of such vessels were discovered. The vessel that was unearthed at Beram in the course of recent excavations is coarser with respect to the previously described jugs, and features nub-shaped decorations that are not characteristic for this type of vessels. The most similar example of such a vessel stems from the same site, where a partially preserved urn decorated with nub-shaped decorations, but with no handles, was discovered during the excavations carried out by Moser (Kučar 1979, 96, T.V: 8). Nub-shaped protuberances appear as decoration on pottery already during the Early Bronze Age, and they become characteristic primarily during the period of the Middle Bronze Age (Čović 1983, 126, T. XIV: 1, 7), but there are also to be found on pottery of the Iron Age. Similarly decorated vessels are also found on necropolises at Nesactium (Mihovilić 2001, T. 39: 5, 8, 9), Kaštel near Buje (Cestnik 2009, T. 1: 1; T. 2: 3; T. 3: 1), Pula (Percan 2008, T. 3: 19; T. 11: 64), Limska Gradina (Urem 2012, T. 39: 9, 10, 11) and elsewhere. As was already mentioned, vessels with one intentionally (ritually) broken handle are a phenomenon characteristic of the Villanova culture (Mihovilić 2001a, 173). Although scarce, similar specimens are also known from Iron age necropolises in Istria. In graves I/22, 23 from Nesactium, a vessel with one intentionally broken handle was unearthed. Although this vessel features two horizontally, not vertically, positioned handles, one of which was intentionally broken, it appears together with other offerings that date this grave to the 10<sup>th</sup> or 9<sup>th</sup> century BCE, which coincides temporally with the urn from Beram (Mihovilić 2001, T.31:5; Mihovilić 2001a,

<sup>13</sup> Primjeri *Wasserkrug* vrčeva pronađeni su na nekropolama u Nezakciju (Mihovilić 2001, 68-73), Puli (Percan 2008, 16-18), Rovinju (Matošević, Mihovilić 2004, 11) i Picugima (Amoroso 1889, 243).

<sup>13</sup> Specimens of *Wasserkrug* jugs were discovered on the necropolises at Nesactium (Mihovilić 2001, 68-73), Pula (Percan 2008, 16-18), Rovinj (Matošević, Mihovilić 2004, 11), Picugi (Amoroso 1889, 243).



1959, 45, 46, T. 24: B 8). Još jedna žara s dvije okomito postavljene ručke potječe iz Picuga, a datirana je u 9. – 8. st. pr. Kr. (Mihovilić 2001a, 175). Po svemu navedenome vidljivo je da su posude u funkciji žara s dvije ručke prilično rijetka pojava u Istri, ali i da se vilanovski utjecaj ritualnog razbijanja jedne ručke javlja ne samo na navedenim nekropolama, već i u nekropoli u Bermu, što potvrđuje pronalazak jedne takve žare s odlomljenom ručkom.

S obzirom na očite sličnosti u formi posuda te datacijsku podudarnost potvrđenu provedenom radiokarbonskom analizom, možemo pretpostaviti da ovaj tip posuda odgovara inicijalnoj fazi razvoja *Wasserkrug* vrčeva. Sudeći po dosadašnjim istraživanjima, oni u Bermu nisu postali standardni dio repertoara pogrebnog ritusa, za razliku od nekih drugih istovremenih nekropola gdje njihova brojnost svjedoči o popularnosti koju su uživali među ondašnjim stanovništvom, a važno je i naglasiti ritual odlamanja jedne ručke čiji utjecaji sežu u vilanovski kulturni krug.

## Grobni prilozi

Metalni predmeti koji se često pojavljuju u svojstvu grobnih priloga obično su ključni za datiranje samih grobova. Pri tome su osobito korisni nalazi poput igala, fibula ili narukvica. Unutar žare groba istraženog u Bermu pronađeno je pet ulomaka neukrašenog brončanog lima, deformiranih u vatri. Sudeći po karakteristikama nalaza, najvjerojatnije je riječ o dijelovima široke brončane trakaste narukvice s kvačicom, koja je relativno čest nalaz u nekropolama željeznog doba Istre. Kod ovakvih je narukvica brončana traka obično imala stepenasti isječak na dijagonalno suprotnim kutovima, a kvačica kojom se zatvarala bila je izrađena od savijenog tankog lima i zakovicom pričvršćena za jedan kraj trake, dok se na drugom nalazila rupica (Mihovilić 1989–1990, 30). Na jednom pronađenom ulomku vidljiva je zakovica na kojoj se originalno nalazila kvačica za kopčanje, dok sama kvačica nije sačuvana (sl. 18, 19).

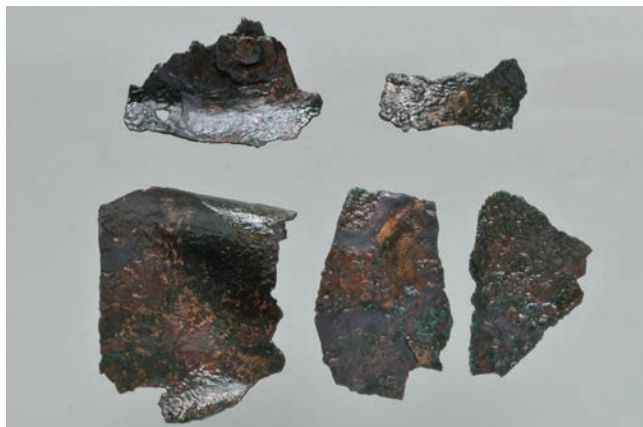
Ove su narukvice inače jako često ukrašene raznim kombinacijama koso šrafiranog meandra i stiliziranim pticama, a ovakav tip narukvice (manžete) predstavlja jedan od tipičnih predmeta histarske željeznodobne kulture, osobito njezinog II. stupnja (9. i 8. st. pr. Kr.), kad na keramici i brončanim predmetima prevladavaju urezani ili gravirani geometrijski motivi (Gabrovec, Mihovilić 1987, 306). Na istarskom poluotoku ovakve su narukvice pronađene još u Picugima (Amoroso

175). Furthermore, the urn from grave 36 in Pula, with two vertical handles, one of which was intentionally broken (Mihovilić 2001a, 175, T. 2: 2), and the one from grave 67, with both of its handles broken, show an influence of the Villanova culture (Gnirs 1903, Fig. 88: 15; Mihovilić 2001a, 175). The urn from grave 36 at Pula corresponds to urns in the form of a globular jug, which as a rule feature a single, small, vertically placed handle, whereas this one and the one from Beram feature two handles each, one of them being broken (Mihovilić 2001a, 175). There are likewise similarities as compared with an urn from Rome (site Roma – Forum Romanum), which features two vertically placed handles and represents a form typical for the 9<sup>th</sup> century BCE (Müller-Karpe 1959, 45, 46, T. 24: B 8). Another urn with two vertically placed handles comes from Picugi and it is dated into the 9<sup>th</sup> – 8<sup>th</sup> century BCE (Mihovilić 2001a, 175). According to the above, it is evident that vessels with two vertically placed handles, which were used as urns, represent a rather rare phenomenon in Istria, and moreover, that the Villanova-influenced ritual of breaking one of these handles was not limited to the aforementioned necropolises, as it also took place on the necropolis of Beram, which was confirmed by the discovery of one such urn with a broken handle.

Given the obvious similarities in the form of the vessels and the conformity with respect to dating, as was corroborated by the radiocarbon analysis, we can assume that this type of vessels correspond to the initial development phase of *Wasserkrug* jugs. Judging by the excavations that have been conducted so far, those from Beram did not become a standard feature of the burial rite repertory, unlike on some other concurrent necropolises, where their large numbers bear witness to the popularity they enjoyed among the population in those times, and it is likewise important to emphasize the ritual of breaking one of the handles, which is associated with the Villanova cultural sphere.

## Grave offerings

Metal objects that often appear as grave goods are usually the key for dating the graves themselves. Particularly useful for this purpose are finds like pins, fibulae or bracelets. Inside the urn from the grave excavated at Beram, we discovered five fragments of undecorated bronze sheet metal, which were deformed in the fire. Judging by the characteristics of the finds, these fragments were most likely parts of a broad, strap bracelet made of bronze and equipped with a small clasp. Such bracelets represent a relatively common find



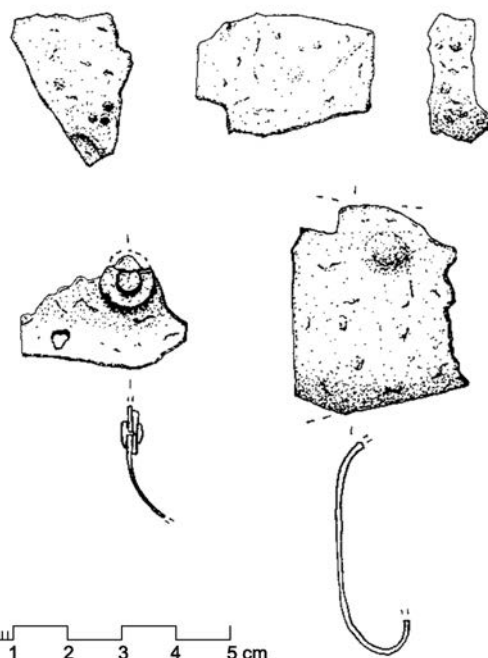
Sl. 18 Ulomci brončane narukvice nakon restauracije (PN 18)  
Fig. 18 Fragments of a bronze bracelet after restoration (PN 18)

1889, T. 10:1-9; Mihovilić 1989-1990, T. V, VI, VII), Nezakciju (Mihovilić 1989-1990, T. II, III, IV:1), Puli (Gnirs 1925, 60, Abb. 46; Percan 2008, T. 33: 292 - 295, 301, 302, T. 34: 303 - 310), ali i Bermu (Kuçar 1979, 113, T. XII:1; Mihovilić 1989-1990, T. IV: 2-5). Za datiranje je najzahvalniji primjerak iz Nezakcija, iz groba 35 u zoni VI, koji je zajedno sa svojim priložima smješten u 8. st. pr. Kr., odnosno stupanj IIb, a u isti je stupanj datiran i ulomak iz Berma (Kuçar 1979, T. 12:1-2). S obzirom da nedostaje analognih primjeraka izvan istarskog prostora, čini se da su te narukvice u ovom obliku tipične za istarsko područje horizonta II, a mogle su nastati kao interpretacija, iako u puno skromnijoj veličini, italiskog tipa rombičnog pojasa ili pojase kopče (Mihovilić 1989-1990, 42)<sup>14</sup>. Još jedan nalaz važan za dataciju je onaj iz groba 125 iz Pule, koji je sadržavao široku trakastu brončanu narukvicu s ostacima spaljenih kostiju i fragmentima pet brončanih igala. Kao ni na našem primjeru, tako ni na ovoj narukvici nije vidljiv nikakav ukras, no bez obzira na to ovaj je grob dragocjen za određivanje datiranja. Naime, sve pronađene igle iz groba 125 pulske nekropole bez imalo sumnje mogu se datirati u 8. st. pr. Kr., odnosno u horizont IIb željeznog doba Istre (Percan 2008, 28).

Sudeći po rezultatima provedene radiokarbonske analize, beramski primjer, otkriven u recentnim istraživanjima, pripada ipak nešto ranijem vremenu, odnosno kraju 10. ili početku 9. st. pr. Kr. (najvjerojatnije kraju stupnja Istra Ib i početku Istra IIa).

Drugi grobni prilog koji je, kako je to već spomenuto, na MDCT snimku dokumentiran kao vertikalno

<sup>14</sup> Upravo su ovakve narukvice najraniji istraživači histarskih nekropola, izuzev A. Gnirsa, tumačili kao brončane pojaseve.



Sl. 19 Tehnički crtež ulomaka narukvice (PN 18)  
Fig. 19 Technical drawing of the bracelet fragments (PN 18)

in Istrian Iron Age necropolises. They feature a bronze strap that usually had a step-like cutout on diagonally opposing corners. The clasp that was used to close it, was made of bent, thin sheet metal, and was fastened to one end of the strap with a rivet, a small perforation being on the other end (Mihovilić 1989-1990, 30). A rivet is visible on one of the discovered fragments, on which the clasp used to close the bracelet was located, but the clasp itself was not preserved (Fig. 18, 19).

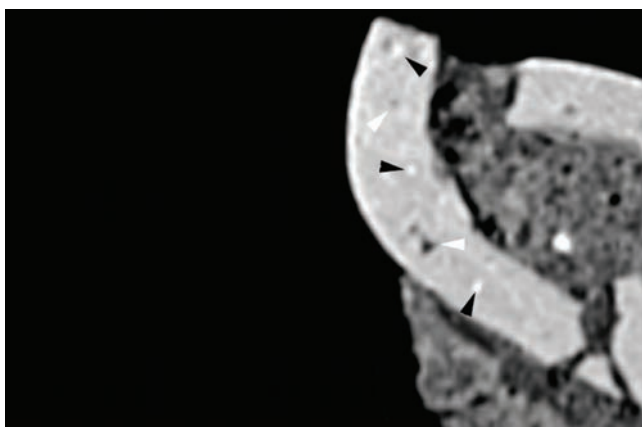
These bracelets are otherwise very often decorated with various combinations of obliquely hatched meanders and stylized birds, and this type of bracelet (cuffs) represents an object that is typical for the Histrian Iron Age culture, especially its phase II (9<sup>th</sup> and 8<sup>th</sup> centuries BCE), when in the majority of cases incised or engraved geometrical motifs prevail on pottery and objects made of bronze (Gabrovec, Mihovilić 1987, 306). On the Istrian Peninsula, such bracelets were also discovered at Picugi (Amoroso 1889, T. 10:1-9; Mihovilić 1989-1990, T. V, VI, VII), Nesactium (Mihovilić 1989-1990, T. II, III, IV:1), Pula (Gnirs 1925, 60, Fig. 46; Percan 2008, T. 33: 292 - 295, 301, 302, T. 34: 303 - 310) and also at Beram (Kuçar 1979, 113, T. XII:1; Mihovilić 1989-1990, T. IV: 2-5). As far as dating is concerned, the most informative specimen seems to come from Nesactium, from grave 35 in zone VI, which was together with its

postavljena struktura koja se račvala pri vrhu, visoka približno 7,2 cm, bio je pigment umbra. Umbro je prirodna mješavina željeznog i manganova oksida, čija se uporaba može pratiti još od prapovijesnog perioda<sup>15</sup>. Pigment ima zemljane tonove koji variraju od smeđe do crvenkasto-smeđe boje, ovisno o postotku željenih i manganovih komponenti. S obzirom na oblik uzorka u kojem je dokumentiran, možemo pretpostaviti da je originalno u grob bio priložen zamotan u neki organski materijal koji je uvjetovao njegov oblik, a u međuvremenu je istrunuo. S obzirom da se radi o pigmentu, možemo pretpostaviti da je korišten primjerice za oslikavanje tijela, tetoviranje<sup>16</sup> ili ukrašavanje tkanina odnosno nekih drugih materijala. Drugim riječima, ovaj bi grobni prilog mogao predstavljati predmet koji je pokojnik koristio za života, ali i simbolizirati zanat kojim se bavio (sl. 23).

## Rezultati MDCT istraživanja

### Žara

Višeslojna kompjutorska tomografija (MDCT) pokazala je da je urna oštećena, odnosno da je vrat posude utočio u njezino tijelo. Slojevi dobiveni CT-om (0,5 mm) otkrili su prilično nehomogenu glinu s malim, okruglim neprozirnim dijelovima nepropusnim za x-zrake (najveća gustoća: 2150 U.H.; najveći promjer: 2.0 mm) i rijetkim malim područjima propusnim za x-zrake (sl. 20).



Sl. 20 MDCT presjek urne (sloj 0,5 mm)

Fig. 20 MDCT thin (0.5mm) section of the urn

Sadržaj urne predstavljaju spaljeni ostaci koji su bili smješteni u donji dio posude te pokriveni pepelom i zemljom sve do njezina oboda (sl. 21). Među spaljenim ostacima vidljivo je pet ulomaka brončane narukvice (sl. 22).

<sup>15</sup> Ovaj je pigment dokumentiran već u neolitskim spiljskim oslicima.

<sup>16</sup> Pigmenti umbra se i danas koriste za istu svrhu.

offerings dated into the 8<sup>th</sup> century BCE, or phase IIb, and the fragment from Beram was dated into the same phase (Kučar 1979, T. 12:1-2). Due to an absence of analogies outside of Istrian territory, it seems that these bracelets, in this form, are typical for the Istrian area of Horizon II, and that they could have been created as an interpretation of the Italic type of rhombic belt or belt buckle<sup>14</sup>, although in a much more modest size (Mihovilić 1989 – 1990, 42). Another find that played an important role in dating is the one from grave 125 at Pula, which contained a broad, strap bracelet made of bronze, together with the remains of cremated bones and fragments of five bronze pins. As was the case with the specimen from Beram, this bracelet too is devoid of any decorations; however, this grave is nonetheless valuable for dating purposes. In fact, all the pins found in grave 125 from the necropolis at Pula can be, without any doubt, dated to the 8<sup>th</sup> century BCE, or into Horizon IIb of the Iron Age in Istria (Percan 2008, 28).

Judging by the results of the radiocarbon analysis, the specimen from Beram, which was unearthed during the recent excavations, belongs to a somewhat earlier period, i.e., to the end of the 10<sup>th</sup> or the beginning of the 9<sup>th</sup> century BCE (most probably to the end of phase Istria Ib and the beginning of Istria IIa).

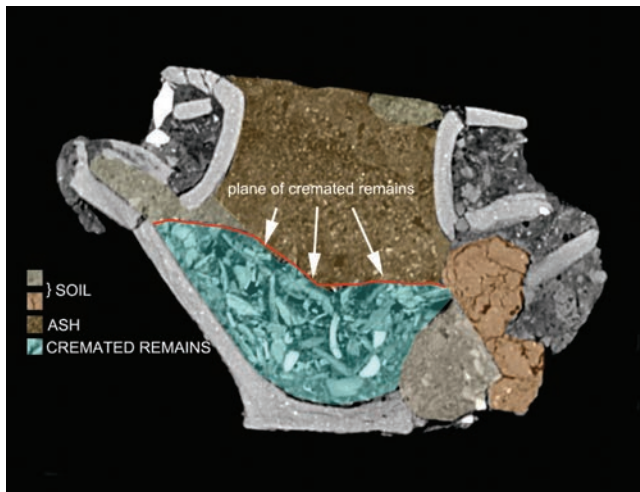
As was already mentioned, the other grave offering that was documented on MDCT imagery as a vertically placed structure forking at the top, whose height is approximately 7.2 cm, is umber, a natural pigment. UMBER is a natural mixture of iron and manganese oxides, whose use can be traced back already from the prehistoric period<sup>15</sup>. This pigment has earthy tones that vary from brown to reddish-brown in color, depending on the percentage of iron and manganese components. With regard to the form in which the sample was documented, it can be assumed that it was wrapped into some organic material that conditioned its shape when it was originally placed into the grave, which has decomposed in the meantime. Given that it is a pigment, it can also be assumed that it was used, for example, for body painting, tattooing<sup>16</sup>, or decorating cloths or other materials. In other words, this grave offering could represent an object that the deceased individual used during his life, but it could also symbolize the craft that he practiced (Fig. 23).

<sup>14</sup> It was precisely these bracelets that were interpreted as bronze belts by the earliest explorers of Histrian necropolises, with the exception of A. Gnirs.

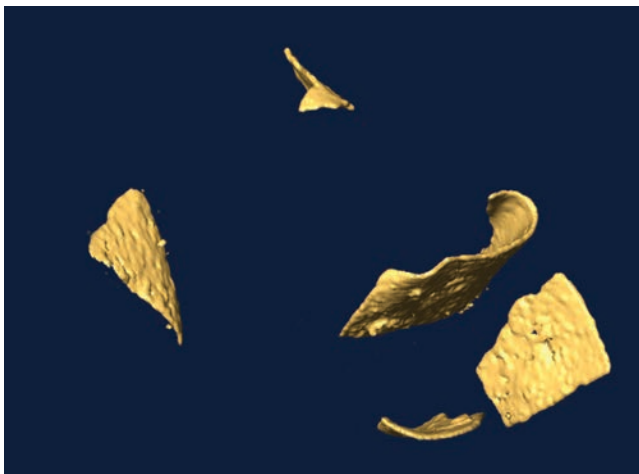
<sup>15</sup> This pigment has been documented already on Neolithic cave paintings.

<sup>16</sup> UMBER pigments are used for the same purpose nowadays.





Sl. 21 Stratigrafski položaj sadržaja urne na temelju MDCT snimka  
Fig. 21 Stratigraphic planes of the urn content as shown by MDCT



Sl. 22 MDCT 3-D rekonstrukcija metalnih dijelova (naručica)  
Fig. 22 MDCT 3-D reconstruction of metallic fragments (bracelet)

Od gornje margine spaljenih ostataka, MDCT analiza otkrila je za x zrake nepropusnu strukturu usmjerenu prema ušću urne, koja se račva u gornjem dijelu, sačinjena od spojenih cilindričnih dijelova promjera od 1 mm (sl. 23). Mikroiskopavanje potvrdilo je oblik i strukturu spaljenih ostataka, kao i ostalih predmeta prvotno uočenih na CT snimku (sl. 24, 25).



Sl. 23 MDCT 3-D rekonstrukcija za x-zrake blago neprozirne strukture koja se nalazi prema otvoru urne  
Fig. 23 MDCT 3-D reconstruction of a faintly radiopaque structure directed towards the mouth of the urn

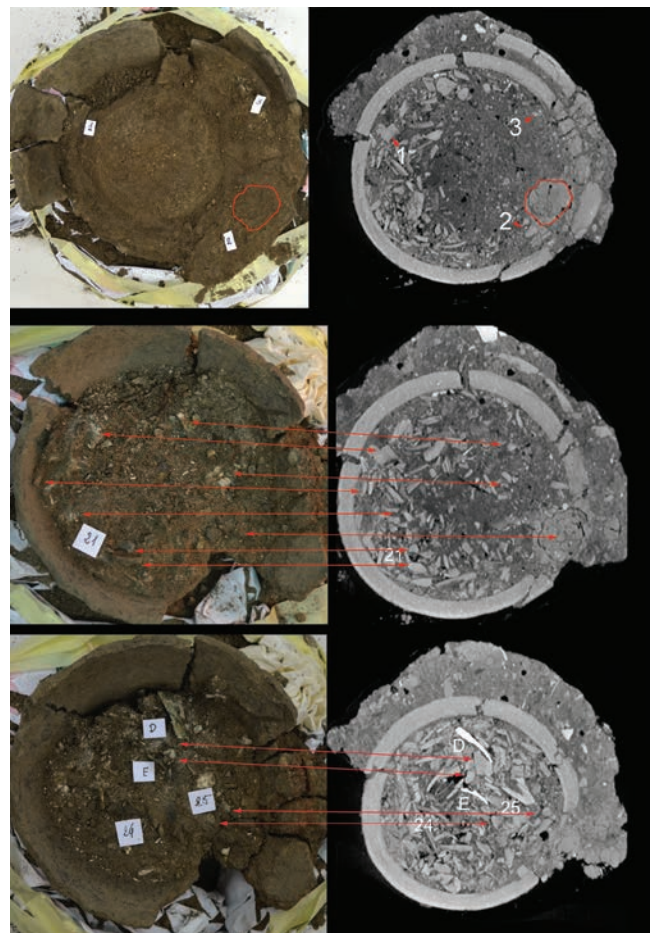
## Results of MDCT analysis

### Cinerary urn

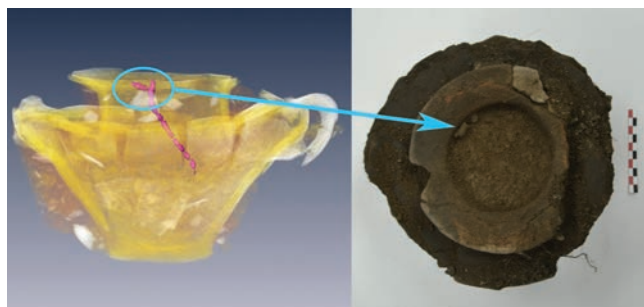
The urn appears collapsed on MDCT imagery. CT thin sections (0.5 mm) reveal a rather inhomogeneous clay tempered with small, rounded, radiopaque particles (maximal density: 2150 U.H.; maximal diameter 2.0 mm), and rare, small, radiolucent areas (minimal density: - 5 U.H.) (Fig. 20).

The cinerary content consisted of cremated remains that were placed in the nether half of the urn, and covered with ashes and soil up to its rim (Fig. 21). Visible between the cremated remains were five fragments of a bracelet (Fig. 22).

From the upper margin of the cremated remains, a faintly radiopaque structure directed towards the mouth of the urn was revealed by MDCT analysis, which forks in its upper section, and is represented by contiguous, cylindrical units of 1 mm in diameter (Fig. 23). The micro-excavation confirmed the close similarity between



Sl. 24 Veza između mikroiskopavanja i MDCT-a  
Fig. 24 Correspondence between micro-excavation and MDCT

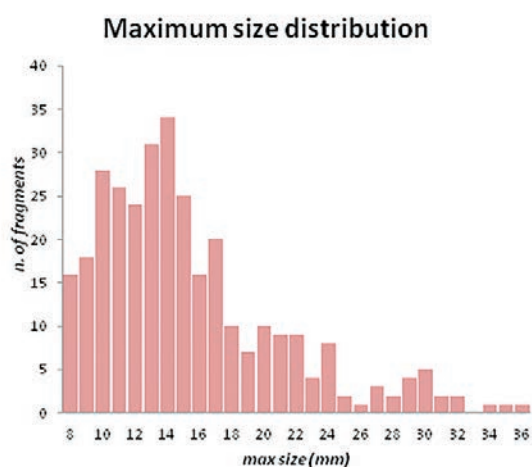


Sl. 25 Veza između mikroiskopavanja i MDCT-a  
Fig. 25 Correspondence between micro-excavation and MDCT

### Antropologija

Urna je sadržavala vrlo fragmentirane spaljene ostatke. Dimenzije ostataka prikazane su na slici 26 i tablici 1. Zanimljivo je napomenuti da mikroiskopavanje doprinosi većoj fragmentaciji spaljenih ostataka te na taj način smanjuje mogućnost prepoznavanja nekih od njih (sl. 27). Oko 20 posto ulomaka bili su dijelovi lubanje. Mogli su se prepoznati sljedeći elementi:

- ulomak lijeve jagodične kosti;
- ulomak desne strane čeljusti s praznim alveolama za trajne zube (43, 44 i 45); čeljust je manjih dimenzija i nježnijeg izgleda;
- ulomak (desna strana?) grane donje čeljusti;
- ulomak lijevog (?) petroznog dijela sljepoočne kosti s očuvanim slušnim košćicama (sl. 28);
- dva vrlo fragmentirana ulomka čunjaste kosti šake;
- mali ulomak zglobne čašice lopatice.



Sl. 26 Veličina i čvrstoća kremiranih ostataka  
Fig. 26 Size and consistency of the cremated remains

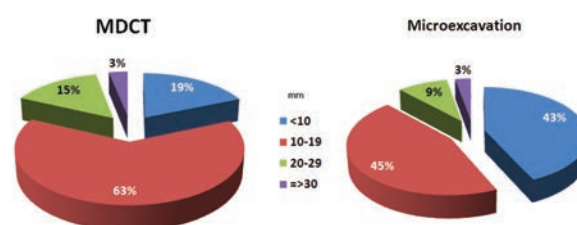
Oblici i dimenzije ulomaka omogućuju nam da utvrdimo da spaljeni ostaci pripadaju odrasloj ženskoj osobi. Nisu uočeni ulomci s patološkim promjenama.

CT imagery and the cremated remains as well as non-osseous objects, both in shape and structure (Fig. 24, 25).

### Anthropology

The cinerary urn contained cremated remains that were in a very fragmentary state. The dimensions of these cremated fragments are presented in Fig. 26 and Tab. 1. It is interesting to note that micro-excavation tends to increase the fragmentation of the remains, reducing the possibility of their identification (Fig. 27). About 20% of the fragments were from a skull. The only recognizable elements were:

- a fragment of the left zygomatic bone;
- right fragment of lower jaw with empty sockets for permanent teeth (43, 44 and 45). The jaw appears very delicate in shape and rather small in size;
- a fragment (right?) of the mandibular, horizontal, posterior ramus;
- a fragment of left (?) petrous part of temporal bone with ossicles (Fig. 28);
- two very incomplete fragments of the scaphoid bone
- a small fragment of the glenoid cavity of the scapula.



Sl. 27 Rasprostranjenost fragmentacije kremiranih ostataka: MDCT nasuprot mikroiskopavanja

Fig. 27 Distribution of fragmentation of the cremated remains: MDCT vs. micro-excavation

Based on the shape and dimensions of these fragments we can attribute the remains to an adult female individual. No fragments with pathologic changes were discovered.

The cremated remains weighed 150 g, which corresponds to approximately 15 - 20% of the cremated body of a female adult.

The temperature of cremation was evaluated at > 600 °C in a reducing environment, for a short period (delaminated white surface of the diploic bone with white-blue trabeculae; delaminated white surface of long bone, less than 1 mm thick, and black or blue-black bone under it), and it was apparently not uniform.

Težina spaljenih kostiju je 150 g, što je oko 15 – 20 % ukupne težine kremiranog tijela odrasle žene.

Kosti su spaljene na temperaturi većoj od 600 °C u redukcijskim uvjetima, u kratkom vremenu (raslojavanje bijele površine spužvaste kosti glave s bijelo-plavim trabekulama; raslojavanje bijele površine dugih kostiju debljine manje od 1 mm i crna ili bijelo-crna kost ispod nje) i vidljivo neujednačeno.

## ZAKLJUČNA RAZMATRANJA

Istraživanja provedena na beramskoj nekropoli tijekom 2013. godine povratak su ishodištu prapovijesne arheologije u Istri. S obzirom da su istraživanja provedena 1883. bila prva arheološka istraživanja nekog prapovijesnog lokaliteta na istarskom poluotoku, odmak od 130 godina dopušta nam primjenu tada nepoznatih, a i po današnjim standardima najsuvremenijih metoda i tehnika istraživanja i analiza, čime se otvaraju mogućnosti značajnog proširivanja dosadašnjih spoznaja o materijalnoj kulturi i običajima stanovnika ovog nalazišta, ali i široj slici željeznog doba Istre.

Rezultati provedene radiokarbonske analize te komparativni primjeri pronađenog pokretnog arheološkog materijala datiraju istraženu grobnu cjelinu na kraj 10. ili sam početak 9. st. pr. Kr., što odgovara kraju stupnja Istra Ib i početku Istra IIa. Sudeći po rezultatima analize koju je provela V. Kučar na materijalu iskopanom prilikom Moserovih istraživanja, a sukladno kojoj se nekropola datira između stupnjeva Istra II i Istra IV (Kučar 1979, 111-121), istraženi grob pripada samom početku korištenja beramske nekropole.

Po tipologiji oblika groba, istraženi primjer spada u najbrojniju skupinu grobova zastupljenih na beramskoj nekropoli. Riječ je o grobu u jednostavnoj grobnjoj jami uklesanoj u matičnu stijenu sa žarom, pokrivenoj jednom ili više kamenih ploča (*a pozzeto*). Po rezultatima Moserovih istraživanja, takvi su grobovi predstavljali čak 82 % svih istraženih (Cestnik 2009, 98-99, sl. 29).

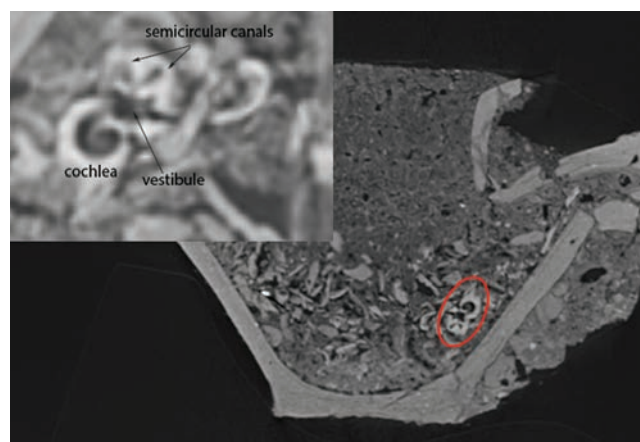
Među dosad objavljenim nalazima s beramske nekropole ne nalazimo materijal koji bi tipološki u potpunosti odgovarao onome pronađenome prilikom recentnih istraživanja. Tipološki najbliži primjer žare je parcijalno sačuvana posuda pronađena prilikom Moserovih istraživanja, ukrašena bradavičastim ukrasima, no bez ijedne ručke. Posudi nedostaje obod pa je teško sa sigurnošću govoriti o njezinoj originalnoj formi (Kučar 1979, 96, T.V: 8). Iako su

## CONCLUDING CONSIDERATIONS

The excavations that were carried out on the necropolis at Beram in the course of 2013 represent a renewed visit to the starting point of prehistoric archaeology in Istria. Considering that the 1883 excavations were the first archaeological excavations of a prehistoric site on the Istrian Peninsula, a time lapse of 130 years allows us to employ methods that were in those days unknown, and which according to present-day standards represent cutting edge methods and techniques of research and analysis. This opens up countless possibilities of widening current perceptions as regards the material culture and customs of the inhabitants that used to live on this site, and it also gives us a wider insight into the Iron Age period in Istria.

The results of the radiocarbon analysis, and the comparative specimens from the discovered movable archaeological material, date the explored grave unit to the end of the 10<sup>th</sup> or to the beginning of the 9<sup>th</sup> century BCE, which corresponds to the end of Istria Ib phase and the beginning of Istria IIa phase. Judging by the results of the analysis conducted by V. Kučar on the materials excavated during Moser's excavations, and based on which it was possible to date the necropolis between phases Istria II and Istria IV (Kučar 1979, 111-121), the explored grave belongs to the initial period of use of the necropolis at Beram.

According to the typology of the grave form, the explored specimen belongs into the most numerous group of graves represented on the Beram necropolis. This grave is simple, it consists of a sepulchral pit that has been carved out of bedrock, and an urn covered by one or more



Sl. 28 Ulomak petroznog dijela sljepoočne kosti s očuvanim slušnim košticama

Fig. 28 A fragment of petrous bone showing the inner ear osseous structures



posude s dvije okomito postavljene ručke, kao što je ova iz Berma, prilično rijedak nalaz na željeznodobnim nekropolama u Istri, valja naglasiti utjecaj vilanovskog kulturnog kruga, koji se očituje u ritualnom odnosno namjernom razbijanju jedne ručke, što je slučaj sa žarom pronađenom u Bermu.

Što se tiče pronađene narukvice, tipološke paralele pronalazimo među materijalom prikupljenim prilikom Marchesettijevih istraživanja, kada su pronađeni primjeri širokih trakastih narukvica (manžeta), koje su međutim bile ukrašene urezanim i graviranim geometrijskim motivima (Marchesetti 1884, T. IV: 1, 2)<sup>17</sup>.

Grob istražen 2013. g. nalazi se u zoni za koju dosad nije bilo utvrđeno da pripada nekropoli. Na prostoru između recentno istraženog groba i prostora nekropole istraženog 1883. godine nalaze se recentni pregradni/poduporni zidovi (SJ 8, 9, 19), a većina istraživača je na toj poziciji pretpostavljala postojanje jednog od gradinskih bedema (Amoroso 1889, 225; Kučar 1979, 88; Drempetić 2003, sl. 2; Cestnik 2009, 98). Prilikom istraživanja koja su se odvijala s obje strane pretpostavljenog bedema, ali koja ipak nisu bila usmjerena na njegovo pronalaženje i dokumentiranje, nisu pronađeni nikakvi materijalni tragovi koji bi mogli potvrditi njegovo postojanje. S druge strane, velika količina kumulirane zemlje prepune keramičkih ulomaka koji se mogu datirati u željezno doba na prostoru sonde 2, odnosno na strani okrenutoj naselju, ukazuje da se na ovom mjestu već jako dugo nalazi određena umjetna barijera koja je priječila daljnju eroziju zemlje prema podnožju gradinskog brežuljka. Možemo stoga ostaviti otvorenu mogućnost da je na ovoj poziciji nekada uistinu egzistirao gradinski bedem, koji je naknadno nadomješten postojećim zidovima. U tom je smislu zanimljiv i podatak da se recentno istražen grob može datirati na sam početak ili čak i nešto ranije od dosad pretpostavljenog perioda funkcioniranja nekropole. Može li ovaj podatak sugerirati postupno širenje nekropole prema jugozapadu, paralelno sa širenjem područja obuhvaćenog gradinskim bedemima? U prilog toj pretpostavci govore pojedini nalazi pronađeni u najnižoj stratigrafskoj jedinici sonde 2 (SJ 20), koji daju naslutiti korištenje beramske gradine i prije stupnja Istra II. Također, poznato je da je većina istarskih željeznodobnih nekropola bila smještena unutar pojasa bedema, odnosno između dva pojasa

stone slabs (*a pozzeto*). In accordance with the results of Moser's excavations, such graves represented as much as 82% of all explored graves (Cestnik 2009, 98-99, Fig. 29). Among the finds from the Beram necropolis which have been published to date, we cannot find any material that would typologically fully correspond to that unearthed in the course of recent excavations. In other words, the most similar example of an urn, from a typological point of view, is a partially preserved vessel discovered during Moser's excavations, which is decorated with nub-like decorations but has no handles. The vessel lacks its rim and it is hence difficult to speak with any certainty about its original form (Kučar 1979, 96, T.V: 8). Although vessels with two vertically placed handles, like the one from Beram, represent a rather rare find in Istrian Iron Age necropolises, it is important to emphasize the influence of the Villanova culture, visible in the ritual, i.e., intentional breaking of one of these handles, as is the case with the urn unearthed at Beram.

As regards the discovered bracelet, typological analogies can be found among the material collected during Marchesetti's excavations, when specimens of broad, strap bracelets (cuffs) were unearthed, which, however, were decorated with incised and engraved geometrical motifs (Marchesetti 1884, T. IV: 1, 2)<sup>17</sup>.

The grave explored in 2013 is located in a zone for which it has not yet been established whether it belongs to the necropolis. Located in the area between the recently explored grave and the necropolis explored in 1883, are the recently constructed dividing/supporting walls (SU 8, 9, 19), while the majority of explorers presumed that one of the hillfort walls would be in this position (Amoroso 1889, 225; Kučar 1979, 88; Drempetić 2003, Fig. 2; Cestnik 2009, 98). In the course of excavations that were conducted on both sides of the presumed enclosing wall, but were not focused on its actual discovery or documentation, no material traces corroborating its existence were found. On the other hand, the vast quantity of accumulated soil that contained a huge amount of pottery fragments dated into the Iron Age, in the area of Trench 2, i.e., on the side facing the settlement, points to the fact that a certain artificial barrier had been located on this spot for a very long period of time, which prevented further soil erosion towards the foot of the hillfort hillock. Thus, a real possibility exists that a hillfort wall once stood on this

<sup>17</sup> Jedan ulomak ukrašene trakaste narukvice nalazi se i među materijalom koji je 1883. prof. Podersay poslao C. Marchesettiju (Marchesetti 1883, T. I: 9; Kučar 1979, T. XII: 1).

<sup>17</sup> A single fragment of a decorated strap bracelet is to be found amongst the material that Prof. Podersay sent to C. Marchesetti in 1883 (Marchesetti 1883, T. I: 9; Kučar 1979, T. XII: 1).

bedema naselja<sup>18</sup>. Na ovakvu mogućnost pozicioniranja beramske nekropole upozoravao je još Amoroso (Amoroso 1889, 225), a kasnije to prihvaćaju i neki drugi istraživači (Lonza 1977; Cestnik 2009, 98). Iako mogućnost postupnog širenja nekropole, u korelaciji s gradnjom bedema ili bez nje, zvuči primamljivo, treba biti oprezan s donošenjem zaključaka s obzirom na mali opseg recentnih istraživanja, no taj bi trag u budućnosti svakako trebalo slijediti.

Sudeći po rezultatima istraživanja groba SJ 23, spaljivanje pokojnika odvijalo se na nekom sekundarnom položaju s kojeg su posmrtni ostaci prenošeni do samoga groba<sup>19</sup>. Grobni prilozi spaljivani su zajedno s pokojnikom, o čemu svjedoče ulomci narukvice deformirani vatrom, pronađeni unutar žare. Nakon spaljivanja tek je dio posmrtnih ostataka pohranjivan unutar žare. Što se tiče pripreme same urne, postupak je bio prilično jednostavan: kremirane kosti, koje su vjerojatno bile dodatno fragmentirane s obzirom na njihovo stanje nakon hlađenja, položene su u žaru bez nekog preciznog anatomskog redoslijeda. Približno pola žare napunjeno je kostima, na što su stavljani pepeo i zemlja, vjerojatno s mjesta kremiranja. Uz kosti je položen i defunkcionalizirani metalni predmet (narukvica). Na vrh žare stavljen je umbro zamotan u neki organski predmet. Nakon toga je urna postavljena na njenu konačnu poziciju te prekrivena kamenom pločom. Urna je sadržavala kremirane kosti, koje vjerojatno potječu od odrasle žene. Nekoliko prepoznatljivih ulomaka bili su dijelovi gornjih udova i lubanje: čini se da se izbor kostiju može povezati s malom veličinom žare. Dio posmrtnih ostataka pohranjivan je i u prostoru oko žare, odnosno unutar grobne jame.

Sukladno pretpostavkama koje je na temelju analiza grobnih priloga pojedinih istarskih željeznodobnih nekropola iznijela V. Cestnik, prisustvo narukvica, kao uostalom i nekih drugih vrsta nakita, poput naušnica, sljepoočničarki, torkvesa, prstenja, staklenih i jantarnih perli, saltaleona, koji se ne javljaju zajedno s oružjem, možemo pripisati ženskoj nošnji (Cestnik 2009, 122), a što odgovara zaključcima antropoloških istraživanja.

position, which was later substituted with the existing walls. With this in mind it is interesting to note that the recently excavated grave can be dated to the very beginning of the period during which the necropolis was presumably functioning, or even somewhat earlier. Can this piece of information suggest a gradual broadening of the necropolis towards the southwest, parallel with the expansion of the area enclosed with the hillfort walls? Certain finds unearthed in the lowest stratigraphic unit of trench 2 (SU 20), speak in favor of this assumption. They lead us to suspect that the hillfort at Beram was in use even before the Istria II phase. Likewise, it is known that the majority of Istrian Iron Age necropolises were located within the enclosing walls, or between two enclosing walls of a settlement<sup>18</sup>. Amoroso was in his time suggesting the possibility that the necropolis at Beram was thus positioned (Amoroso 1889, 225), which was later accepted by some other explorers (Lonza 1977; Cestnik 2009, 98). Although the possibility of a gradual widening of the necropolis, in correlation with the erection of the enclosing walls or without it, sounds appealing, one has to be careful when making such conclusions due to the small scale of recent excavations, but the aforementioned trail should definitely be further explored in the future.

Judging by the results of the excavation of grave SU 23, the cremation of the deceased was carried out on a secondary location, from where the remains of the deceased were then taken to the grave itself<sup>19</sup>. Grave offerings were cremated together with the deceased, which was corroborated by bracelet fragments that were deformed by the fire and discovered in the urn. After the deceased was cremated, only some of the ashes were deposited in the urn. As regards the preparation of the urn, this was quite simple: the cremated bones, probably fragmented further with respect to their situation after cooling, were placed into the urn without a precise anatomical sequence. The vessel was half-filled with bones, the other half being reserved for ashes and soil that probably came from the place of cremation. A defunctionalized metal object (a bracelet) was placed with the bones. The last object that

<sup>18</sup> Takve primjere nalazimo u Nezakciju (Mihovilić 2001, 27, sl. 24), Puli (Gnirs 1925, 48–49, Abb. 28; Mihovilić 2013, 70), Oračini-Prezenaku (Mihovilić 2013, 37), Kaštelu kod Buja (Cestnik 2009, 16), Limske gradini (Mihović 1972; Mihovilić 2013, 82) i drugdje.

<sup>19</sup> Amoroso ukazuje na postojanje ustrinuma u neposrednoj blizini nekropole, o čemu su po njegovoj pretpostavci svjedočili crna zemlja i komadići ugljena (Amoroso 1889, 230).

<sup>18</sup> Examples for this can be found at Nesactium (Mihovilić 2001, 27, Fig. 24), Pula (Gnirs 1925, 48–49, Fig. 28; Mihovilić 2013, 70), Oračina-Prezenak (Mihovilić 2013, 37), Kaštel near Buje (Cestnik 2009, 16), Limska Gradina (Mihovilić 1972; Mihovilić 2013, 82) and elsewhere.

<sup>19</sup> Amoroso points out to the existence of an ustrinum in the immediate vicinity of the necropolis, which is according to him corroborated by black soil and small lumps of coal (Amoroso 1889, 230).

Iskopavanja provedena 2013. g. dala su smjernice za neka buduća istraživanja beramske nekropole, ali mogu poslužiti i kao smjernica za istraživanja na ostalim nalazištima sličnog karaktera. Terenska istraživanja u Bermu svakako valja vezati uz područje na kojemu je pronađen grob SJ 23. Usmjeravanje istraživanja sjeveroistočno od istraženog groba definiralo bi područje rasprostiranja same nekropole, ali i pomoglo u pokušaju prepoznavanja eventualne horizontalne stratigrafije same nekropole, na što upućuju recentni nalazi. Pritom ne bi trebalo zaobilaziti ni pokušaje definiranja linije pružanja gradinskih bedema, u čemu, osim klasičnih arheoloških iskopavanja, od velike koristi može biti i intenzivno arheološko rekognosciranje terena. U slučaju da se otvori mogućnost za pribavljanje značajnijih financijskih sredstava valjalo bi razmišljati i o primjeni nekih suvremenijih metoda dokumentiranja, koje bi ponudile značajno veće mogućnosti prepoznavanja arheoloških struktura, poput primjerice korištenja LiDAR tehnologije.

Naravno, u svim slučajevima u kojima je to moguće potrebno je napraviti radiokarbonske analize, u cilju datiranja nalaza, što može biti izrazito korisno i za opće zaključke vezane uz materijal i njegovu dataciju u kontekstu beramske nekropole, ali i materijalne kulture željeznog doba Istre općenito.

Rezultati provedenih MDCT analiza pokazuju da one u budućnosti svakako moraju postati neizostavni dio arheoloških istraživanja lokaliteta sličnih karakteristika, s obzirom na otvaranje cijelog niza novih mogućnosti prikupljanja podataka i spoznaja nedostupnih klasičnim arheološkim metodama. Širenje uporabe MDCT-a u kliničke svrhe te njegova niska cijena u provedbi analiza otvorili su nove perspektive za analizu bioloških ostataka i arheoloških artefakata. Ova tehnika je također ojačala koncept nedestruktivne analize, za razliku od tradicionalnog iskopavanja (ili mikroiskopavanja), koje je destruktivno po definiciji i zato neponovljivo. Štoviše, digitalnom slikom se može lako manipulirati mijenjajući njene parametre ili se pak može podvrgnuti matematičkoj transformaciji da se poboljšaju određene strukture ili detalji na njoj.

Primjena ove tehnike na paljevinskim žarama (koje se moraju smatrati kulturnim artefaktom s organskim sadržajem) od posebnog je interesa jer dopušta da se bez promjene njihove morfologije i sastava analiziraju same posude i njihov sadržaj. Tablica 2 prikazuje razlike između tih metodologija.

was put into the urn is umber wrapped in some sort of organic material. Afterwards, the urn was placed in its permanent position and covered with a stone slab. The urn contained some cremated bone fragments that probably belonged to an adult female individual. The few recognizable bone fragments were sections of the upper limbs and of the skull: the bone material was probably chosen this way due to the small volume of the urn. Some of the cremated remains were also strewn in the area around the urn, within the grave pit.

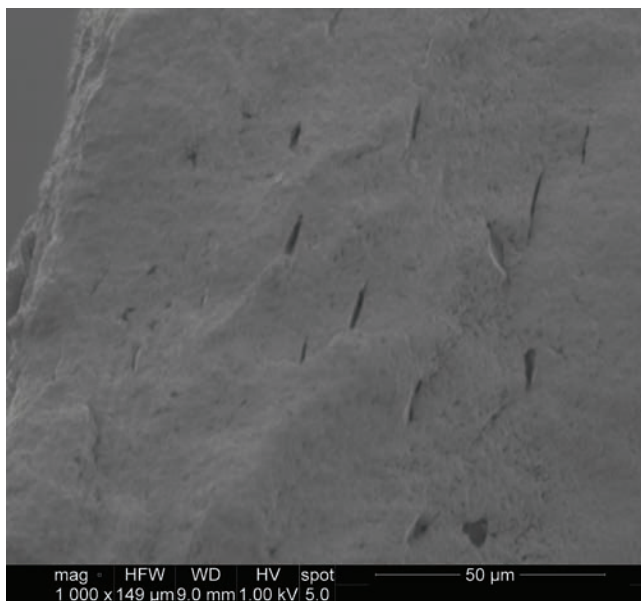
According to the assumptions put forward by V. Cestnik on the basis of analyses of grave offerings from certain Istrian Iron Age necropolises, the presence of bracelets and of some other kinds of jewelry such as earrings, temple decorations, torques, rings, glass and amber beads, and saltaleoni, coupled with the lack of any weapons, can be attributed to female attire (Cestnik 2009, 122), which still further corroborates the findings of anthropological studies.

The excavations carried out in the course of 2013 provided us with certain guidelines for future excavations of the necropolis at Beram, but they can likewise be applied for excavations on other sites having a similar character. The field excavations at Beram should certainly be connected to the area where grave SU 23 was discovered. The extent of the necropolis would be defined if the excavations were to be directed towards the northeast from the explored grave. This would also aid the efforts to recognize an eventual horizontal stratigraphy of the necropolis, and recent finds point in that direction. At the same time we should try to define the direction in which the hillfort wall extended itself, and that could be done by classical archaeological excavations, as well as with an intensive archaeological survey of the terrain, which could be very beneficial. In case there is an opportunity to get strong financial backing for this, more modern documentation methods should be used, which would offer significantly greater possibilities for the recognition of archaeological structures, as would be the case, for example, if LIDAR technology were to be used.

Naturally, radiocarbon analyses should be conducted whenever possible in order to date the finds, which could also be of great help in drawing general conclusions from the material and its dating, not only in the context of the Beram necropolis, but for the material culture of the Istrian Iron Age in general.



Rezultati istraživanja jasno ukazuju na to da ne postoje značajne razlike između MDCT-a i analize mikroiskopavanjem. Zapravo, MDCT je omogućio istraživanje nekih složenih segmenata (čeljust, unutarnje uho) koje bi inače bilo teško proučavati (ili bi to bilo nemoguće) metodama mikroiskopavanja i tradicionalne antropološke analize. Međutim, analiza urne nije bila darežljiva što se tiče antropoloških detalja, zbog fragmentacije materijala i nepotpunosti ostataka. Nekoliko prepoznatljivih ulomaka omogućilo nam je da napravimo prilično pouzdanu spolnu dijagnozu, a isto tako smo bili u stanju isključiti mogućnost da su ostaci pripadali djetetu. Podvrgavanjem materijala mikroskopskoj analizi izbjegli smo izračun biološke dobi (Bradtmiller 1984, Holden 1995) jer su osteoni, kao što je pokazalo probno SEM skeniranje, pokazivali deformiranost, izmijenjenu površinu ili izgled te rekristalizaciju hidroksiapatita (sl. 29).



Sl. 29 SEM kremirane kortikalne kosti koja pokazuje deformiranost strukture kosti, izmijenjenu površinu ili izgled te rekristalizaciju hidroksiapatita

Fig. 29 SEM of a cremated cortical bone showing bone structure deformation, altered spatial distribution, and hydroxyapatite recrystallization

Korištenjem MDCT-a usput su otkriveni i neki zanimljivi detalji, prije svega prisutnost pigmenta umbra. Ne samo da nam je MDCT dao priliku da identificiramo ovaj zanimljivi detalj, nego nam je i omogućio da saznamo njegov točan oblik i prostor, što je iznimno teško postići putem mikroiskopavanja.

Istraživanje beramske nekropole provedeno 2013. u potpunosti je ispunilo očekivanja i, unatoč malo istraženju površini, donijelo niz novih spoznaja o

The results from the performed MDCT analyses show that in the future they must become an unavoidable part of archaeological excavations because they open a whole series of new possibilities for the gathering of data that would otherwise be off limits if classical archaeological methods were used. The spread of MDCT for clinical purposes and its low cost per investigation have opened new perspectives when analyzing biological remains and ancient artifacts. This technique has also strengthened the concept of non-destructive analysis, unlike traditional excavation (or micro-excavation) which is destructive by definition and therefore not repeatable. Moreover, digital imagery can be easily manipulated by changing its parameters, or subjected to mathematical transformation to enhance structures or details contained in it.

The application of this technique to cinerary urns (a cultural artifact with organic content) is of particular interest because it permits to analyze both the container and its contents without altering their morphology and composition. Table 2 shows the differences between these methodologies.

In this case it is clear that there are no significant differences between MDCT and micro-excavation analyses. In effect, by using MDCT it was possible to study some complex segments (alveolar processes of the jaw, inner ear), which would otherwise be very difficult (or impossible) when using micro-excavation and traditional anthropological analysis. However, the urn analysis failed to provide us with a great amount of anthropological data because the material was scanty and fragmentary, and the remains incomplete. Notwithstanding that, the few recognizable fragments allowed us to rather reliably define sex, and to rule out the possibility that the remains belonged to an infant. By subjecting the material to a microscopic analysis we avoided the calculation of biological age (Bradtmiller 1984, Holden 1995) since the osteons, as demonstrated by a test scan with SEM, showed evidence of deformation, altered spatial distribution, and hydroxyapatite recrystallization (Fig. 29).

It is also worth mentioning that the use of MDCT revealed some interesting details, like the presence of umber wrapped in an organic material. The use of MDCT gave us the opportunity to identify this interesting detail, giving it a precise form and position, which would be extremely difficult using micro-excavation.

The excavation of the necropolis at Beram, which was conducted in 2013, fulfilled all our expectations because it provided us with some new insights related to the

načinima funkcioniranja ovog prostora u prapovijesnom razdoblju. Ovaj pregled istraživanja provedenih 2013. na nekropoli u Bermu jasno pokazuje veliki znanstvenoistraživački potencijal nalazišta, koji bi u budućnosti svakako trebao biti iskorišten.

functioning of this site in the prehistoric period, in spite of the small area that was excavated. This review of the excavations conducted at Beram in 2013 clearly shows the great scientific and exploratory potential of this site, of which good use should be made in the future.

Tab. 1. Veličina i čvrstoća kremiranih ostataka

Maksimalna veličina (mm)	MDCT	Mikro-iskopavanje
<10	65	153
10 - 19	221	159
20-29	52	32
=>30	11	10
	<b>349</b>	<b>354</b>

Table 1. Size and consistency of the cremated remains

Max. size (mm)	MDCT	Micro-excavation
<10	65	153
10 - 19	221	159
20-29	52	32
=>30	11	10
	<b>349</b>	<b>354</b>

Tab. 2. Žara: mikroiskopavanje nasuprot MDCT-u

	MIKRO-ISKOPAVANJE	MDCT
Poteškoća	Velika, može se smanjiti iskustvom; ovisno o sadržaju žare	Velika, može se smanjiti iskustvom; neovisno o sadržaju žare
Sekundarna fragmentacija kostiju	Značajna	Nema
Jasnoća koštanog sadržaja	Dobra	Dobra
Dimenzije	Dobro	Dobro
Težina kostiju	Da	Ne
Određivanje temperature kremacije	Da, kolorimetrično (empirično)	Moguće rendgenskom denzitometrijom (numerično)
Određivanje spola	Moguće	Moguće
Određivanje starosti kod smrti	Moguće	Moguće
Paleopatološka analiza	Moguća	Moguća
Istraživanje morfologije i strukture posude	Nakon pražnjenja i restauriranja	Da, nakon “virtualnog restauriranja” te morfodenzitometrične analize
Fragmentacija grobnih priloga	Općenito visoka zbog oksidacije; predmete s visokim stupnjem oksidacije nije moguće spasiti	Nema; iako je potpuno oksidirao i veći dio mu je uništen, nalaz se može rekonstruirati u mjerilu 1:1 zahvaljujući neprozirnosti oksida koji označavaju njegove rubove
Položaj grobnih priloga	Da, ako ih je moguće spasiti	Da
Arheološka klasifikacija	Da	Da
Muzealizacija	Da, samo posuda i predmeta koje je moguće restaurirati	Da, virtualna



Table 2. Cinerary urn: micro-excavation vs. MDCT

	<b>MICRO-EXCAVATION</b>	<b>MDCT</b>
Difficulty	High. Can be reduced by experience. Dependent on the matrix of the contents of the urn.	High. Can be reduced by experience. Not dependent on the matrix of the contents of the urn.
Secondary bone fragmentation	Significative	None
Legibility of bone content	Good	Good
Measurements	Good	Good
Bone weight	Yes	No
Cremation temperature determination	Yes, colorimetric (empiric)	Possible by X-ray densitometry (numeric)
Sex determination	Possible	Possible
Age at death determination	Possible	Possible
Paleopathological analysis	Possible	Possible
Study of the morphology and the structure of the container	After emptying and restoration.	Yes, after “virtual restoration” and morfodensitometric analysis.
Funerary goods fragmentation	Generally high, due to oxidation. Objects with high grade of oxidation are not recoverable.	None. The object can be reconstructed in scale 1:1, even if completely oxidized and mostly dissolved, thanks to the radiopacity of oxides that mark the outline.
Funerary goods position	Yes, if recoverable.	Yes
Archaeological classification	Yes	Yes
Musealization	Yes, only the container and restorable objects.	Yes, virtual.

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